Name of the Department: Mechanical Engineering

BTPHXX-18 - Physics & Physics Lab

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measur Attainment of CO
CO1: To be able to understand the basic principles of Quantum mechanics and to apply these to the complex phenomenon of matter radiation interaction	√		√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO 2: To be able to understand the concept of wave packets using Heisenberg's uncertainty principle.			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO 3: To be able to apply Schrodinger's wave equations to study the complex physical phenomenon.			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO 4: To be able to understand the structure of crystalline solids by applying knowledge of crystallography.			√		√		√	√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO 5: To be able to understand semiconducting materials by using the concepts of band theory of solids.	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam

BTAMXX-18 - Maths-1

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Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1:Students will be able to remember terminologies and formulae in matrices, complex	√		√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO2: Students will be able to understand and interpret the concepts of matrices, complex			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO3:Students will be able to compare and analyze the methods in matrices, complex numbers	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams

BTEE101-18 Basic Electrical Engineering

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Have the knowledge of DC circuits, AC Circuits, basic magnetic circuits, working principles of electrical machines, and components of low voltage	√	√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO 2: Be able to analyze of DC circuits, AC Circuits		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam
CO 3: Understand the basic magnetic circuits and apply it to the working of electrical machines		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam

CO 4: Be introduced to types of wiring, batteries, and LT switchgear.		√	√		√		√	√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams

BTEE101-18 Basic Electrical Engineering Lab

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: The ability to use common electrical measuring instruments and understand the fundamentals of electrical engineering.	√	√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO 2: The ability to make electrical connections, and measure power, power factor using appropriate equipments.		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO 3: Have the knowledge of electrical machines, components and their ratings		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO 4: Understand the operation of transformers and electrical machines		√	√		√		√	√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams

Paper BTME101-18 Engineering Graphics & Design

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO

CO1: design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety.	√	√	√	√	√	√	√	√	√	√	√	√	Design	Yes	Minor Exams, Quiz, Assignments, Term Exams
CO 2: to prepare to communicate effectively.	√	√	√	√	√	√	√	√	√	√	√	√	Communicate	Yes	Minor Exams, Quiz, Assignments, Term Exams
CO 3: to prepare to use the techniques, skills, and modern engineering tools necessary for engineering practice.	√	√	√	√	√	√	√	√	√	√	√	√	Apply	Yes	Minor Exams, Quiz, Assignments, Term Exams

BMPD101-18 Mentoring and professional Development

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Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: The student will be able to effectively communicate and present technical material.	√	√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam
CO2: Ability to think critically and creatively to generate innovative and optimum solutions.		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam
CO3:The student will be able to identify, evaluate and synthesise information from a range of sources to optimise process engineering design and		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam
CO4: Engage in continuous education, training and research, and take control of their own learning and overall development.		√	√		√		√	√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam

BTCH101-18 - Chemistry -1

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.	√		√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
Rationalise bulk properties and processes using thermodynamic considerations.			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.			√		√		√	√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
List major chemical reactions that are used in the synthesis of molecules.	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams

BTCH102-18 - Chemistry Lab

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Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO

Estimate rate constants of reactions from concentration of reactants/products as a function of time	√		√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
Synthesize a small drug molecule and analyse a salt sample			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
BTAMXX-18 Mathematics II															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: The mathematical tools needed in evaluating multiple integrals and their usages.	√		√	√	√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO 2: The effective mathematical tools for the solutions of differential equations that model physical processes.			√	√	√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO 3: The tools of differentiation and integration of functions that are used in various techniques dealing engineering problems.			√	√	√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
BTPS101-18 Programming for Problem Solving															

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
To formulate simple algorithms for arithmetic and logical problems.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
To translate the algorithms to programs (in C language).		√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
To test and execute the programs and correct syntax and logical errors.		√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
To implement conditional branching, iteration and recursion.		√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
To decompose a problem into functions and synthesize a complete program using divide and conquer approach.		√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
To use arrays, pointers and structures to formulate algorithms and programs.		√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.		√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.		√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams

BTPS102-18 Programming for Problem Solving Lab

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
To formulate the algorithms for simple problems	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
To translate given algorithms to a working and correct program	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
To be able to correct syntax errors as reported by the compilers	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
To be able to identify and correct logical errors encountered at run time	√	√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
To be able to write iterative as well as recursive programs	√	√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
To be able to represent data in arrays, strings and structures and manipulate them through a program	√	√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
To be able to declare pointers of different types and use them in defining self referential structures.	√	√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams

To be able to create, read and write to and from simple text files.	√	√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams

Paper BTMP 101-18 Workshop/Manufacturing Practices

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different	√	√	√	√	√	√	√			√	√	√	Understanding	Yes	Minor Exams, Project based learn Assignments,End Term Exams
CO 2: able to fabricate components with their own hands.	√	√	√	√	√	√	√			√	√	√	Apply	Yes	Minor Exams, Project based learn Assignments,End Term Exams
CO 3: Get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.	√	√	√	√	√	√	√			√	√	√	Understanding	Yes	Minor Exams, Project based learn Assignments,End Term Exams
CO 4: By assembling different components, they will be able to produce small devices of their interest.	√	√	√	√	√	√	√			√		√	Apply	Yes	Minor Exams, Project based learn Assignments,End Term Exams

Paper BTHU101-18 English

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**

The objective of the course is to help the students become the independent users of English language.	√	√	√	√	√	√	√			√	√	√	Understanding	Yes	Minor Exams, Project based learn Assignments,End Term Exams
Students will acquire basic proficiency in reading & listening, comprehension, writing and speaking skills.	√	√	√	√	√	√	√			√	√	√	Apply	Yes	Minor Exams, Project based learn Assignments,End Term Exams
Students will be able to understand spoken and written English language, particularly the language of their chosen technical field.	√	√	√	√	√	√	√			√	√	√	Understanding	Yes	Minor Exams, Project based learn Assignments,End Term Exams
They will be able to converse fluently.	√	√	√	√	√	√	√			√		√	Apply	Yes	Minor Exams, Project based learn Assignments,End Term Exams

Paper BTHU102-18 English Lab

Department of Mechanical Engineering
I.K.G. P.T.U. Main Campus
Kapurthala

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
The objective of the course is to help the students become the independent users of English language.	√	√	√	√	√	√	√			√	√	√	Understanding	Yes	Minor Exams, Project based learn Assignments,End Term Exams
Students will acquire basic proficiency in listening and speaking skills.	√	√	√	√	√	√	√			√	√	√	Apply	Yes	Minor Exams, Project based learn Assignments,End Term Exam
Students will be able to understand spoken English language, particularly the language of their chosen technical field.	√	√	√	√	√	√	√			√	√	√	Understanding	Yes	Minor Exams, Project based learn Assignments,End Term Exam

They will be able to converse fluently	√	√	√	√	√	√	√			√		√	Apply	Yes	Minor Exams, Project based learn Assignments,End Term Exams

BMPD101-18 Mentoring and professional Development

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employabilit y / Entrepreneu rship	Assessment Tools to Measu Attainment of CO
CO1: The student will be able to effectively communicate and present technical material.	√	√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO2: Ability to think critically and creatively to generate innovative and optimum solutions.		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO3:The student will be able to identify, evaluate and synthesise information from a range of sources to optimise process engineering design and		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO4: Engage in continuous education, training and research, and take control of their own learning and overall development.		√	√		√		√	√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams

Paper BTME301-18 Fluid Mechanics

HOD
Department of Mechanical Engineering
I.K.G. P.T.U. Campus
Kapurthala

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employabilit y / Entrepreneu rship	Assessment Tools to Measu Attainment of CO

CO1: Understand the concept of fluids and their properties.	√	√	√			√	√		√	√		√	Understanding	Yes	Minor Exams, Quiz, Assignments, Term Exams
CO 2:Apply the concept to solve the problems related to statics, dynamics and kinematics	√	√	√			√	√		√	√		√	Understanding	Yes	Minor Exams, Quiz, Assignments, Term Exams
CO3: Use and apply dimensional analysis and similitude techniques to various physical	√	√	√			√	√		√	√		√	Understanding	Yes	Minor Exams, Quiz, Assignments, Term Exams
CO4: Distinguish various types of flows and learn flow measurement methods.	√	√	√			√	√		√	√		√	Analyse	Yes	Minor Exams, Quiz, Assignments, Term Exams

BTME302-18 Theory of Machines -1

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Kapurthala

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: Understand constructional and working features of important machine elements.	√	√	√	√	√	√			√		√	√	Understanding	Yes	Minor Exams, Assignments, End T Exams
CO2: Design belt, rope and chain drives for transmission of motion from one shaft to	√	√	√	√	√	√			√		√	√	Understanding	Yes	Minor Exams, Assignments, End T Exams
CO3: Identify different Cam and follower pairs for different applications and construct cam	√	√	√	√	√	√			√		√	√	Understanding	Yes	Minor Exams, Assignments, End T Exams

CO4: Understand the function of brakes, dynamometers, flywheel and governors.	√	√	√	√	√	√			√		√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams

BTME303-18 : Machine Drawing

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Read, draw and interpret the machine drawings and related parameters.	√	√	√							√	√	√	Understanding	Yes	Minor Exams, Class and Home Assignments, End Term Exam
CO2: Use standards used in machine drawings of machine components and assemblies.	√	√	√							√	√		Applying	Yes	Minor Exams, Class and Home Assignments, End Term Exam
CO3: Learn the concept of limits, fits and tolerances in various mating parts.	√	√	√							√	√		Understanding	Yes	Minor Exams, Class and Home Assignments, End Term Exam
CO4: Visualize and generate different views of a component in the assembly.	√	√	√		√					√	√	√	Applying	Yes	Minor Exams, Class and Home Assignments, End Term Exam
CO5: Use CAD tools for making drawings of machine components and assemblies.	√	√	√		√					√	√	√	Applying	Yes	Minor Exams, Class and Home Assignments, End Term Exam

BTME304-18 STRENGTH OF MATERIALS-I

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Kapurthala

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the concepts of stress and strain at a point, in the members subjected to axial, bending, torsional loads and temperature changes.	√	√	√			√			√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End T Exams
CO 2: Determine principal stresses, maximum shearing stress and their angles, and the stresses acting on any arbitrary plane within a structural element.	√	√	√			√			√	√	√	√	Understanding and Analysing	Yes	Minor Exams, Assignments, End T Exams
CO 3: Find bending moment and shear force over the span of various beams subjected to different kinds of loads.	√	√	√		√	√			√	√	√	√	Analysing	Yes	Minor Exams, Assignments, End T Exams
CO 4: Calculate load carrying capacity of columns and struts and their buckling strength.	√	√	√		√	√			√	√	√	√	Analysing	Yes	Minor Exams, Assignments, End T Exams
CO 5: Evaluate the slope and deflection of beams subjected to loads.	√	√	√		√	√			√	√	√	√	Analysing	Yes	Minor Exams, Assignments, End T Exams

BTME305-18 Basic Electronics Engineering

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
Understand construction of diodes and their rectifier applications.	√	√	√			√			√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End T Exams

Appreciate the construction and working bipolar junction transistors and MOSFETs.	√	√	√			√			√	√	√	√	Understanding and Analysing	Yes	Minor Exams, Assignments, End T Exams
Design Op-Amp IC based fundamental applications.	√	√	√		√	√			√	√	√	√	Analysing	Yes	Minor Exams, Assignments, End T Exams

Paper Basic Thermodynamics BTME 305-18

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: Apply energy balance to Systems and Control Volumes in situations involving heat and work interactions.	√	√	√		√		√	√	√	√	√		Applying	Yes	Minor Exams, Quiz, demonstrati through videos/ lab, End Term E
CO2: Evaluate changes in thermodynamic properties of substances		√	√	√	√				√		√	√	Applying	Yes	Minor Exams, Quiz, demonstrati through videos/ lab, End Term E
CO3:Evaluate performance of energy conversion devices		√	√	√	√				√		√	√	Applying	Yes	Minor Exams, Quiz, demonstrat through videos/ lab, End Term E
CO4:Explain and apply various gas power and vapor power cycles		√	√	√	√	√			√	√	√		Understanding	Yes	Minor Exams, Quiz, demonstrat through videos/ lab, End Term E

BTME306-18 Strength of Material Lab

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Measure the various mechanical properties such as tensile and compressive strength, impact strength, torsion strength and fatigue strength and hardness	√	√	√	√		√			√	√	√	√	Understanding	Yes	Quiz, Viva
CO 2: Calculate load carrying capacity of long columns and their buckling strength.	√	√	√	√		√			√	√	√	√	Understanding and Analysing	Yes	Quiz, Viva

BTME307-18 Theory of Machines Lab

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Understand constructional and working features of important machine elements.	√	√	√	√	√	√			√		√	√	Understanding	Yes	Minor Exams, Assignments, End Exams
CO2: Design belt, rope and chain drives for transmission of motion from one shaft to															
another	√	√	√	√	√	√			√		√	√	Designing	Yes	Minor Exams, Assignments, End Exams
CO3: Identify different Cam and follower pairs for different applications and construct cam															

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profile for required follower motion.	√	√	√	√	√	√			√		√	√	Designing	Yes	Minor Exams, Assignments, End Exams
CO4: Understand the function of brakes, dynamometers, flywheel and governors.	√	√	√	√	√	√			√		√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
Paper BTME308-18 Fluid Mechanics Lab															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: Distinguish various type of flows and flow measurement methods and concept of															
statics and dynamics of liquids.	√				√		√		√	√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO 2: Determine discharge and head loss, hydraulic and friction coefficient, for different															
types of flow in pipe and open channels.							√		√	√		√	Analyse	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
BMPD301-18 Mentoring and professional Development															

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Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: The student will be able to effectively communicate and present technical material.	√	√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam
CO2: Ability to think critically and creatively to generate innovative and optimum solutions.		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam
CO3:The student will be able to identify, evaluate and synthesise information from a range of sources to optimise process engineering design and		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam
CO4: Engage in continuous education, training and research, and take control of their own learning and overall development.		√	√		√		√	√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam

BTME401-18 APPLIED THERMODYNAMICS

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Course Outcome	PO 1 (Engineering	PO 2 (Problem	PO 3 (Design/De	PO 4 (Conduct)	PO 5 (Modern	PO 6 (The Engi	PO 7 (Environme	PO8 (Ethics)	PO 9 (Individual	PO 10 (Communic	PO 11 (Project Man	PO 12 (Life long	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Explain the functioning and performance evaluation of reciprocating air compressors.	√		√	√	√	√	√		√	√		√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End T Exams
CO 2: Analyze the combustion phenomenon in boilers and I.C. engines.	√	√		√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams

CO 3: Use of Steam Tables and MollierChart to solve vapour power cycle problems.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO 4: Demostrate the constructional features and working of steam power plants and to evaluate their performance.	√	√	√	√	√	√	√		√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams

Paper BTME 402-18 Fluid Machines

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO1 0**	**PO1 1**	**PO1 2**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: Determine discharge and head loss, hydraulic and friction coefficient, for different types of flow in pipe and open channels.	√	√	√			√	√		√	√		√	Knowledge	Yes	Lectures, Tutorials, Assignmen Powerpoint Presentations, Numer etc.
CO 2:Know about constructional details, working and design aspects of runner/wheel and evaluate the performance of various turbines like Pelton, Kaplan and Francis.	√	√	√			√	√		√	√		√	Knowledge	Yes	Lectures, Tutorials, Assignmen Powerpoint Presentations, Numer etc.
CO 3: Know about constructional details, working and evaluate the performance of centrifugal pump under different vane shape conditions.	√	√	√			√	√		√	√		√	Knowledge	Yes	Lectures, Tutorials, Assignmen Powerpoint Presentations, Numer etc.
CO 4: Know about constructional details, working and evaluate the performance of reciprocating pump and evaluate the effect of various deviations from the ideal															
CO5: Know about constructional details and working of hydraulic devices like fluid coupling, accumulator and intensifier.													Knowledge	Yes	Lectures, Tutorials, Assignment Powerpoint Presentations, Numer etc.

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BTME403-18 STRENGTH OF MATERIALS-II

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the concepts of stress and strain at a point, in the members subjected to axial, bending,.torsional loads and temperature changes.	√	√	√			√			√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End T Exams
CO 2: Determine principal stresses, maximum shearing stress and their angles, and the stresses acting on any arbitrary plane within a structural element.	√	√	√			√			√	√	√	√	Understanding and Analysing	Yes	Minor Exams, Assignments, End T Exams
CO 3: Find bending moment and shear force over the span of various beams subjected to different kinds of loads.	√	√	√		√	√			√	√	√	√	Analysing	Yes	Minor Exams, Assignments, End T Exams
CO 4: Calculate load carrying capacity of columns and struts and their buckling strength.	√	√	√		√	√			√	√	√	√	Analysing	Yes	Minor Exams, Assignments, End T Exams
CO 5: Evaluate the slope and deflection of beams subjected to loads.	√	√	√		√	√			√	√	√	√	Analysing	Yes	Minor Exams, Assignments, End T Exams

BTME404-18 MATERIALS ENGINEERING

Course Outcome	PO 1 (Engineering	PO 2 (Problem	PO 3 (Design/De	PO 4 (Conduct)	PO 5 (Modern	PO 6 (The Engi	PO 7 (Environme	PO8 (Ethics)	PO 9 (Individual	PO 10 (Communic	PO 11 (Project Man	PO 12 (Life long	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO

CO1: Illustrate the significance of structure-property-correlation for engineering materials including ferrous and nonferrous.	√	√		√	√	√	√		√	√	√	√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End T Exams
CO 2: Explain the use and importance of various heat treatment processes used for engineering materials and their practical applications.	√		√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams
CO 3: Identify the various structural changes occurred in metals with respect to time temperature transformations.	√	√	√	√	√	√	√		√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams
CO 4: Interpret the significance of Fe-C and TTT diagram for controlling the desired structure and properties of the materials.	√	√		√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams

BTME405-18 : Theory of Machines -II

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: Understand the basic concepts of inertia forces & couples applied to reciprocating parts of a machine.	√	√	√	√							√	√	Understanding & Applying	Yes	Minor Exams, Assignments, End T Exams
CO2: Understand balancing of rotating and reciprocating parts of machines.	√	√	√	√	√						√	√	Understanding & Applying	Yes	Minor Exams, Assignments, End T Exams
CO3: Select suitable type of gears for different application and analyse the motion of different elements of gear trains.	√	√	√	√	√						√	√	Understanding & Applying	Yes	Minor Exams, Assignments, End T Exams

CO4: Understand the concept and application of gyroscopic effect.	√	√	√	√	√						√	Understanding & Applying	Yes	Minor Exams, Assignments, End T Exams
CO5: Gain knowledge of kinematic synthesis.	√	√	√	√	√					√	√	Understanding & Applying	Yes	Minor Exams, Buisness Quiz, End Exams

EVS101-18 ENVIRONMENTAL SCIENCE

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
Students will enable to understand environmental problems at local and national level through literature and general awareness.	√	√	√	√							√	√	Understanding & Applying	Yes	Minor Exams, Assignments, End T Exams
The students will gain practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various	√	√	√	√	√						√	√	Understanding & Applying	Yes	Minor Exams, Assignments, End T Exams
The students will apply interdisciplinary approach to understand key environmental issues and critically analyze them to explore the possibilities to mitigate	√	√	√	√	√						√	√	Understanding & Applying	Yes	Minor Exams, Assignments, End T Exams
Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world	√	√	√	√	√							√	Understanding & Applying	Yes	Minor Exams, Assignments, End T Exams

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BTME406-18 APPLIED THERMODYNAMICS Lab

Course Outcome	PO 1 (Engineerin	PO 2 (Problem	PO 3 (Design /De	PO 4 (Conduct)	PO 5 (Modern	PO 6 (The Engi	PO 7 (Environme	PO8 (Ethics)	PO 9 (Individual	PO 10 (Communic	PO 11 (Project Man	PO 12 (Life long	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Explain the functioning and performance evaluation of reciprocating air compressors.	√		√	√	√	√	√		√	√		√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End T Exams
CO 2: Analyze the combustion phenomenon in boilers and I.C. engines.	√	√		√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams
CO 3: Use of Steam Tables and MollierChart to solve vapour power cycle problems.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams
CO 4: Demostrate the constructional features and working of steam power plants and to evaluate their performance.	√	√	√	√	√	√	√		√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams

Paper BTME407-18 Fluid Machines Lab

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Conduct experiments on scaled down models or on actual size hydraulic machines and evaluate results in terms of unit or specific quantities for comparison	√	√	√		√	√	√		√	√	√	√	Applying	Yes	Case Study, Group Discussions e
CO 2: Understand the working of various hydraulic machines (turbines and pumps) and can suggest remedial solutions for various faults.	√	√	√		√	√	√		√	√	√	√	Understanding	Yes	Case Study, Group Discussions e

Paper BTME408-18 Material Engineering Lab

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
Analyse the microstructure of different ferrous and non-ferrous samples.	√	√	√		√	√	√		√	√	√	√	Applying	Yes	Case Study, Group Discussions
Explore the effect of heat treatment on various engineering materials by analysing its microstructure and hardness	√	√	√		√	√	√		√	√	√	√	Understanding	Yes	Case Study, Group Discussions

BMPD401-18 Mentoring and professional Development

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: The student will be able to effectively communicate and present technical material.	√	√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO2: Ability to think critically and creatively to generate innovative and optimum solutions.		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams
CO3:The student will be able to identify, evaluate and synthesise information from a range of sources to optimise process engineering design and		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams

CO4: Engage in continuous education, training and research, and take control of their own learning and overall development.		√	√		√		√	√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam

BTME501-18 Heat Transfer

Course Outcome	PO 1 (Engineering	PO 2 (Problem	PO 3 (Design/De	PO 4 (Conduct)	PO 5 (Modern	PO 6 (The Engi	PO 7 (Environme	PO8 (Ethics)	PO 9 (Individual	PO 10 (Communic	PO 11 (Project Man	PO 12 (Life long	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
To teach students the basic principles of conduction, radiation, and convection heat transfer. Students will demonstrate an understanding of the basic	√		√	√	√	√	√		√	√		√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End Exams
To extend the basic principle of conservation of energy to systems that involve conduction, radiation, and heat transfer. Students will demonstrate an understanding of	√	√		√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
To train students to identify, formulate, and solve engineering problems involving conduction heat transfer. Students will demonstrate the ability to formulate practical	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
To train students to identify, formulate, and solve engineering problems involving forced convection heat transfer, natural convection heat transfer, and heat	√	√	√	√	√	√	√		√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
To train students to identify, formulate, and solve engineering problems involving radiation heat transfer among black surfaces and among diffuse gray surfaces.	√	√	√	√	√	√	√		√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams

BTME502-18 : Design of Machine Elements

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Demonstrate recalling and applying knowledge of Basic Sciences, Graphics & Drawing, Basic Manufacturing Processes and Material Science, for design	√	√	√	√	√	√				√	√	√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End T Exams
CO2: Comprehend the effect of different stresses and strains under various loading conditions on the mechanical components and identify the mechanism/mode of	√	√	√	√	√	√				√	√	√	Understanding and Applying	Yes	Minor Exams, Assignments, End T Exams
CO3: Examine and solve design problems involving machine elements on the basis of various theories of failure.	√	√	√	√	√	√				√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End T Exams
CO4: Synergize forces, moments and strength information to develop ability to analyze, design and/or select machine elements aiming for safety, reliability, and	√	√	√	√	√	√	√			√	√	√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End T Exams

Paper BTME 503-18 Manufacturing Processes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Understand the different conventional manufacturing methods employed for making different products.	√	√	√		√	√	√			√	√	√	Understanding	Yes	Minor Exams, Quiz, Assignments, Term Exams
CO 2: Understand the different unconventional manufacturing methods employed for making different products.	√	√	√		√	√	√			√	√	√	Understanding	Yes	Minor Exams, Quiz, Assignments, Term Exams

Paper BTME 503-18 Management & Engineering Economics

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Explain the development of management and the role it plays at different levels in an organization.	√						√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam
CO 2: Comprehend the process and role of effective planning, organizing and staffing for the development of an organization.							√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam
CO 3: Understand the necessity of good leadership, communication and coordination for establishing effective control in an organization.							√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam
CO 4: Understand engineering economics demand supply and its importance in economics decision making and problem solving.							√	√		√		√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam
CO 5: Calculate present worth, annual worth and IRR for different alternatives in economic decision making.	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam
CO 6: Understand the procedure involved in estimation of cost for a simple component, product costing and depreciation, its methods.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam

Paper BTME 503-18 Heat Transfer Lab

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Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
Design and fabricate the experimental setups related to heat transfer phenomena.	√	√	√		√	√	√			√	√	√	Understanding	Yes	Minor Exams, Quiz, Assignments, Term Exams
Measure and analyse different heat transfer parameters.	√	√	√		√	√	√			√	√	√	Understanding	Yes	Minor Exams, Quiz, Assignments, Term Exams

Paper BTME 506-18 Manufacturing Processes Laboratory

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Determine/calculate the clay content, moisture content, hardness, permeability and grain fineness number of moulding sand sample.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
CO 2: Use oxy-acetylene gas welding, manual arc welding, MIG, TIG and spot-welding processes to make various joints.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
CO 3: Use machine tools such as lathe, shaper and milling machine for machining/cutting various profiles on work pieces.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
CO 4: Learn about the constructional features and working of grinding machines, hydraulic press, draw bench, rolling mills, drawing and extrusion equipment	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams

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Paper BTME 507-18 Numerical Methods Lab

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
Understand different implementation modes of numerical methods.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Use the numerical methods with the understanding of limitations of these methods for solving problems.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Develop and implement their own computer programs.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Solve problems more accurately and efficiently in low computational time.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Handle the problems conveniently which are difficult to deal with manually	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams

Paper BTMC102-18 ESSENCE OF INDIAN KNOWLEDGE TRADITION

Department of Mechanical Engineering
I.K.G. P.T.U. Main Campus
Kapurthala

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO

Understand the Philosophy of Indian Knowledge system and and its Basic Structure.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Understand the Ancient India Culture, Society and Religion.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Examine the areas of Indian Linguistic Tradition.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Know the contrubtion of scientists of different eras.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Handle the problems conveniently which are difficult to deal with manually	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Paper BTME 409-18 4 weeks industrial training															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
Capability to acquire and apply fundamental principles of engineering.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Become master in one's specialized technology	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams

Become updated with all the latest changes in technological world.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Ability to communicate efficiently.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Knack to be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Ability to identify, formulate and model problems and find engineering solution based on a systems approach.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Capability and enthusiasm for self-improvement through continuous professional development and life-long learning	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
Awareness of the social, cultural, global and environmental responsibility as an engineer.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams

BTME601-18 REFREGERATION AND AIR CONDITIONING

Department of Mechanical Engineering
I.K.G. P.T.U. Main Campus
Kapurthala

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1: Understand the fundamental principles and applications of refrigeration and air conditioning system	√	√	√	√	√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams

CO2: The students will be able to obtain cooling capacity and coefficient of performance by conducting test on refrigeration systems.	√	√	√	√	√		√		√		√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO3: The students will develop ability to calculate the energy requirements of cooling and heat equipment for air conditioning applications.	√		√	√	√	√	√		√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO4: The students will be able to Explain the properties, applications and enironmental issues of different refrigerants.	√	√		√	√	√		√	√	√		√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO5: The students can demonstrate an ability to analysis psychrometric processes and cycles of air conditioning systems.	√	√	√	√	√		√		√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams

Paper BTME602-18 Mechanical Measurements & Metrology

Department of Mechanical Engineering
I.K.G. P.T.U. Main Campus
Kapurthala

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: To provide a knowledge about measurement systems and their components	√	√	√	√	√	√			√	√	√	√	Knowledge	Yes	Lectures, Tutorials, Assignment Powerpoint Presentations, Numer etc.
CO 2: To learn about various sensors and transducers used for measurement of mechanical quantities	√	√	√	√	√	√			√	√	√	√	Understanding	Yes	Lectures, Tutorials, Assignment Powerpoint Presentations, Numer etc.
CO 3: To learn about usage of various measuring instruments.	√	√	√	√	√	√			√	√	√	√	Understanding	Yes	Lectures, Tutorials, Assignment Powerpoint Presentations, Numer etc.

CO 4: To learn metrology of screw, gear and surface texture.	√	√	√	√	√	√			√	√	√	√	Understanding	Yes	Lectures, Tutorials, Assignment Powerpoint Presentations, Numer etc.

BTME603-18 AUTOMOBILE ENGINEERING

Course Outcome	**PO 1 (Engineerin**	**PO 2 (Problem**	**PO 3 (Design /De**	**PO 4 (Conduct)**	**PO 5 (Modern**	**PO 6 (The Engi**	**PO 7 (Environme**	**PO8 (Ethics)**	**PO 9 (Individual**	**PO 10 (Communic**	**PO 11 (Project Man**	**PO 12 (Life long**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: Identify the different parts of the automobile.	√		√	√	√	√	√		√	√	√	√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End T Exams
CO 2: Demostrate the working of various parts like engine, transmission, clutch, brakes, steering and the suspension systems.	√		√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams
CO 3: Explain the need of vehicle safety systems and future developments in the automobile industry.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams

Paper BTME 604-18 Introduction to Industrial Management

Department of Mechanical Engineering
I.K.G. P.T.U.
Kapurthala

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: 1.Understand the complexities associated with management in the organizations and integrate the learning in handling these complexities.	√	√	√		√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exams

CO 2: 2.Demonstrate the roles, skills and functions of management.	√	√	√		√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam
CO 3: 3.Understand the concepts related to industrial management.	√	√	√	√		√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, Assignments,End Term Exam

BTME605-18 REFREGERATION AND AIR CONDITIONING LAB

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: Understand the fundamental principles and applications of refrigeration and air conditioning system	√	√	√	√	√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams
CO2: The students will be able to obtain cooling capacity and coefficient of performance by conducting test on refrigeration systems	√	√	√	√	√		√		√		√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO3: The students will develop ability to calculate the energy requirements of cooling and heat equipment for air conditioning applications.	√		√	√	√	√	√		√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO4: The students will be able to Explain the properties, applications and enironmental issues of different refrigerants.	√	√		√	√	√		√	√	√		√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO5: The students can demonstrate an ability to analysis psychrometric processes and cycles of air conditioning systems.	√	√	√	√	√		√		√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams

Paper BTME606-18 Mechanical Measurements & Metrology Lab

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employabilit y / Entrepreneu rship	Assessment Tools to Measu Attainment of CO
CO1: Demonstrate the use of instruments for measuring linear (internal and external), angular dimensions and surface roughness.	√	√	√	√	√	√			√	√	√	√	Understanding	Yes	Case Study, Group Discussions,
CO 2: Identify proper measuring instrument and know requirement of calibration, errors in measurement etc.	√	√	√	√	√	√			√	√	√	√	Knowledge	Yes	Case Study, Group Discussions,
CO 3: Apply analytical and experimental methods to make measurements and to find and correct defects in measurement systems.	√	√	√	√	√	√			√	√	√	√	Applying	Yes	Case Study, Group Discussions,

Department of Mechanical Engineering
I.K.G. P.T.U. Main Campus
Kapurthala

BTME603-18 AUTOMOBILE ENGINEERING LAB

Course Outcome	PO 1 (En gine erin	PO 2 (Pro ble m	PO 3 (De sign /De	PO 4 (Co ndu ct)	PO 5 (Mo der n	PO 6 (Th e Engi	PO 7 (En viro nme	PO8 (Eth ics)	PO 9 (Ind ivid ual	PO 10 (Co mm unic	PO 11 (Pro ject Man	PO 12 (Lif e long	Skill	Focus on Employabilit y / Entrepreneu rship	Assessment Tools to Measu Attainment of CO
CO1: Identify the different parts of the automobile.	√		√	√	√	√	√		√	√	√	√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End T Exams
CO 2: Demostrate the working of various parts like engine, transmission, clutch, brakes, steering and the suspension systems.	√		√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams

CO 3: Explain the need of vehicle safety systems and future developments in the automobile industry.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams

BTME–608-18 : Minor Project

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1:Identify an open ended problem in area of mechanical engineering which requires further investigation.	√		√		√	√	√	√	√	√	√	√	Understanding	Yes	Reports, Project Presentations and Viva
CO2: Identify the methods and materials required for the project work.	√	√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
CO3: Manage the work with team members.	√		√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
CO4: . Formulate and implement innovative ideas for social and environmental benefits.	√	√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
CO5: Write technical report of the project apart from developing a presentation.	√	√	√	√	√	√	√		√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva

Paper: Internal Combustion Engines 609-18

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Department of Mechanical Engineering
I.K.G. P.T. ... Campus
Kapurthala

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1:Knowledge about the basics of IC engines	√	√	√	√			√		√	√		√	Understanding	Yes	Minor Exams, Quiz, demonstrat through videos/ lab, End Term E
CO2:Ability to evaluate operational characteristics of IC Engines	√	√	√	√		√	√		√	√	√	√	Understanding	Yes	Minor Exams, Quiz, demonstrat through videos/ lab, End Term E
CO3:Ability to ascertain the effects of fuel/supply systems on emission from an engine.		√	√	√	√		√				√	√	Understanding	Yes	Minor Exams, Quiz, demonstrati through videos/ lab, End Term E
CO4:Ability to test engine performance		√	√	√	√		√	√		√		√	Applying		

BTME-610-18 Mechatronics Systems

Department of Mechanical Engineering
I.K.G. P.T.U. Main Campus
Kapurthala

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Design mux, demux, flip-flops, and shift registers.		√	√	√	√		√	√	√	√	√		Applying and Designing	Yes	Minor Exams, Assignments, End T Exams
CO2:Describe the block diagram, registers, ALU, bus systems, timing & control signals, instruction cycles, and interrupts of 8085 microprocessors.	√	√			√		√	√	√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End T Exams

CO3: Apply the concept of 8085 microprocessor instruction sets and addressing modes in writing assembly language program for a given problem.	√	√	√		√	√	√	√	√	√	√		Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO4: Describe the interfacing of memory, 8255 PPI, ADC, DAC, 7-segment LED system, stepper motor, 8251 and 8253 ICs with 8085 microprocessor	√		√	√	√		√			√		√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams

BTME-611-18 Microprocessor in automation

Department of Mechanical Engineering
I.K.G. P.T.U. Main Campus
Kapurthala

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
Student is able to describe the architecture and different modes of operations of a typical microprocessor.		√	√	√	√		√	√	√	√	√		Applying and Designing	Yes	Minor Exams, Assignments, End Exams
Student is able to understand different addressing modes and instructions of 8086 design and develop assembly language programs using software interrupts.	√	√			√		√	√	√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
Student is able to interface memory, I/O devises and interrupt controller with 8086 microprocessors.	√	√	√		√	√	√	√	√	√	√		Applying and Designing	Yes	Minor Exams, Assignments, End Exams
Student is able to describe the internal architecture and different modes of operations of a typical microcontroller	√		√	√	√		√			√		√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
Student is able to design and develop assembly language programs using 8051 microcontroller	√		√	√	√		√			√		√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams

CS 305.6 Student is able to analyze and compare the features of microprocessors and microcontrollers.	√		√	√	√		√			√		√	Applying and Designing	Yes	Minor Exams, Assignments, End T Exams

BTME612-18 COMPOSITE MATERIALS

Course Outcome	PO 1 (Engineerin	PO 2 (Problem	PO 3 (Design /De	PO 4 (Conduct)	PO 5 (Modern	PO 6 (The Engi	PO 7 (Environme	PO8 (Ethics)	PO 9 (Individual	PO 10 (Communic	PO 11 (Project Man	PO 12 (Life long	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Explain the concept, need and applications of composite materials.	√	√	√	√	√	√	√		√	√		√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End T Exams
CO 2: Suggest/select optimum combination of Matrix/Reinforcement for various engineering applications.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams
CO 3: Analyze the effects of influencing factors on the strength of composite materials.	√	√	√	√	√	√	√		√		√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams

BTME-613-18 Computer Aided Design

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Create the different wireframe primitives using parametric representations	√	√	√		√		√	√		√	√		Applying and Designing	Yes	Minor Exams, Assignments, End T Exams

CO2: Create surface primitives using parametric modeling.		√		√	√		√	√	√		√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO3: Create the different solid primitives using the different representation schemes	√		√	√	√		√	√	√	√	√		Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO4: Apply geometric transformations on the created wireframe, surface and solid models.	√	√	√		√	√	√		√	√		√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams

Paper BTME 614-18 Product Design & Development

Department of Mechanical Engineering
I.K.G. P.T.U. Main Campus
Kapurthala

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1: Understand desirable design aspects considering various production processes and also understand the economic factors of design.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Quiz, Assignments, Term Exams
CO 2: Employ engineering, scientific, and mathematical principles to execute a design from concept to finished product.	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Quiz, Assignments, Term Exams
CO 3: Apply the modern approaches to product design considering concurrent design, quality function deployment and various rapid prototyping methods.	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Quiz, Assignments, Term Exams
CO 4: Apply innovative process techniques in synthesizing information, problem-solving and critical thinking.	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Quiz, Assignments, Term Exams

BTME 615-18 : Non Conventional Energy Resources

Course Outcome	PO 1	PO 2	PO3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: To Explain renewable energy sources & systems.	√	√				√						√	Understanding	Yes	Minor Exams, Buisness Quiz, End Exams
CO2: To Apply engineering techniques to build solar, wind, tidal, geothermal, biofuel, fuel cell, Hydrogen and sterling engine	√	√	√	√	√	√	√	√	√		√		Designing	Yes	Minor Exams, Buisness Quiz, End Exams
CO3: To Analyze and evaluate the implication of renewable energy. Concepts in solving numerical problems pertaining to solar radiation geometry and wind	√	√	√	√	√	√	√				√		Applying	Yes	Minor Exams, Buisness Quiz, End Exams
CO4: To Demonstrate self -learning capability to design & establish renewable energy systems.	√	√	√	√	√	√	√	√	√		√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
CO5: To Conduct experiments to assess the performance of solar PV, solar thermal and biodiesel systems	√	√	√	√	√	√	√	√	√		√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams

BTME616-18 : OPERATION RESEARCH

Department of Mechanical Engineering
I.K.G. P.T.U.
Kapurthala

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO

CO1: Explain various mathematical deterministic operation research models.	√	√	√	√	√			√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Class and Hom Assignments, End Term Exam
CO2: Describe the problems of probabilistic and simulation models.	√	√	√	√	√			√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Class and Hom Assignments, End Term Exam
CO3: Demonstrate the queuing, inventory and replacement models etc.	√	√	√	√	√			√	√	√	√	√	Applying and Designing	Yes	Minor Exams, Class and Hom Assignments, End Term Exam
CO4: Formulate and analyze the network models.	√	√	√	√	√			√	√	√	√	√	Applying and Designing	Yes	Minor Exams, Class and Hom Assignments, End Term Exam

BTME617-18: MAINTENANCE & RELIABILITY

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: Understand the concepts of reliability and maintainability	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End T Exams
CO2: The students will be able to use statistical tools to characterise the reliability of an item and determine the reliability of a system, and will also understand	√	√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End T Exams
CO3: The students will develop ability in formulating suitable maintenance strategies to enhance system reliability of a manufacturing system	√	√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End T Exams

Paper BTME701-18 Mechanical Vibrations

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Formulate mathematical models of problems in vibrations using Newton's second law or energy	√	√	√	√	√	√	√		√	√	√	√	Understanding	Yes	Lectures, Tutorials, Assignmen Powerpoint Presentations, Numer etc.
CO 2: Understand the need and measurement of vibration in mechanical systems.	√	√	√	√	√	√	√		√	√	√	√	Understanding	Yes	Lectures, Tutorials, Assignmen Powerpoint Presentations, Numer etc.
CO 3: Calculate principal modes of vibration.	√	√	√	√	√	√	√		√	√	√	√	Applying	Yes	Lectures, Tutorials, Assignmen Powerpoint Presentations, Numer etc.
CO4: Explore the suitable methods of vibration reduction and absorption.	√	√	√	√	√	√	√		√	√	√	√	Applying	Yes	Lectures, Tutorials, Assignmen Powerpoint Presentations, Numer etc.
CO5: Ability to determine vibratory responses of SDOF and MDOF systems.	√	√	√	√	√	√	√		√	√	√	√	Analyse	Yes	Lectures, Tutorials, Assignmen Powerpoint Presentations, Numer etc.
CO6: Ability to determine vibratory responses of SDOF and MDOF systems.	√	√	√	√	√	√	√		√	√	√	√	Analyse	Yes	Lectures, Tutorials, Assignmen Powerpoint Presentations, Numer etc.

Paper BTME702-18 Automation in manufacturing

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
Illustrate the basic concepts of automation in machine tools.															
Analyze various automated flow lines, Explain assembly systems and line balancing methods.	√	√	√	√	√	√	√		√	√	√	√	Applying	Yes	Lectures, Tutorials, Assignment Powerpoint Presentations, Numer etc.
Describe the importance of automated material handling and storage systems.	√	√	√	√	√	√	√		√	√	√	√	Understanding	Yes	Lectures, Tutorials, Assignment Powerpoint Presentations, Numer etc.
Interpret the importance of adaptive control systems, automated inspection systems.	√	√	√	√	√	√	√		√	√	√	√	Applying	Yes	Lectures, Tutorials, Assignment Powerpoint Presentations, Numer etc.

BTME703-18 Fundamentals of Management for Engineers

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: The students understand the significance of Management in their Profession	√					√		√	√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End T Exams
CO2: The various Management Functions like Planning, Organizing, Staffing, Leading, aspects are learnt in this course	√			√	√	√		√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams

CO3: Understand the complexities associated with management in the organizations and integrate the learning in handling these complexities.	√	√	√	√	√	√		√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO4: Demonstrate the roles, skills and functions of management.	√			√	√	√		√	√	√	√	√	Applying	Yes	Minor Exams, Assignments, End Exams

BTME-704-18 : Project-II

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1: To create an Industrial environment and culture within the institution.	√		√		√	√	√	√	√	√	√	√	Understanding	Yes	Reports, Project Presentations and Viva
CO2: To set up production lab utilizing the infrastructure of the institution.	√	√	√		√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
CO3: To standardize laboratories to industrial standard, thereby giving exposure to industrial housekeeping standards.	√	√	√		√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
CO4: Demonstrate an ability to present and defend their research work to a panel of experts.	√		√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
CO5: Demonstrate knowledge of contemporary issues in their chosen field of research.	√	√	√	√	√	√	√		√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva

BTME-801 Software/Industrial Training

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
Capability to acquire and apply fundamental principles of engineering.	√		√		√	√	√	√	√	√	√	√	Understanding	Yes	Reports, Project Presentations and Viva
Become master in one's specialized technology	√	√	√		√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
Become updated with all the latest changes in technological world.	√	√	√		√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
Ability to communicate efficiently.	√		√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
Knack to be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills.	√	√	√	√	√	√	√		√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
Ability to identify, formulate and model problems and find engineering solution based on a systems approach.	√	√	√		√	√	√		√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
Capability and enthusiasm for self-improvement through continuous professional development and life-long learning	√	√	√	√	√	√	√		√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva

Awareness of the social, cultural, global and environmental responsibility as an engineer	√	√	√	√	√	√	√		√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva

Name of Department: Mechanical Department

Paper: Advanced Engineering Materials MTME-101-18

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tool Measure Attainment of CO
CO1: Identify and describe different types of material processing techniques for advanced materials	√	√	√	√		√	√		√	√	√		Understanding	Yes	Minor Exams, Q demonstrations thr videos/ lab, End Exams
CO2: Ability to select suitable material for specific applications	√	√	√	√		√	√	√	√	√		√	Understanding	Yes	Minor Exams, Q demonstrations thr videos/ lab, End Exams

Finite Element Method

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tool Measure Attainment of CO
CO1: Explain the principles of vibrations;	√			√		√	√			√	√	√	Understanding	Yes	Minor Exams, Buis Quiz, End Term Ex
CO2: Define and describe the concepts of vibration modes and natural frequencies and their measurement and estimation for multi-degree-of-freedom systems;	√	√		√		√						√	Understanding	Yes	Minor Exams, Buis Quiz, End Term Ex
CO3: Explain System Modelling via use of Energy Analysis and its application to complex vibrating systems;	√	√	√	√	√	√	√				√		Applying	Yes	Minor Exams, Buis Quiz, End Term Ex
CO4: solve linear 2D structural beams and frames problems; 1Dheat conduction and convection heat transfer problems.	√	√		√		√							Applying	Yes	Minor Exams, Buis Quiz, End Term Ex
CO5:Recognise the use of different numerical techniques and its application to vibration design;	√	√	√	√	√	√			√		√	√	Designing	Yes	Minor Exams, Buis Quiz, End Term Ex

MTME-103 :Advanced Design of Mechanical Systems

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tool Measure Attainment of CO
CO1: Learn integrating CAE, CAD, CAM tools.	√	√	√	√	√	√				√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams

CO2: Learn about proper material selection and know about influence of materials on form design of welded members, forgings and castings.	√	√	√	√	√	√				√	√	√	Understanding and Designing	Yes	Minor Exams, Assignments, End Exams
CO3: Understand general design principles for manufacturability.	√	√	√	√	√	√				√	√	√	Understanding and Designing	Yes	Minor Exams, Assignments, End Exams
CO4: Design to minimize material usage, design for recyclability & energy efficiency and design to regulations and standards.	√	√	√	√	√	√				√	√	√	Understanding and Designing	Yes	Minor Exams, Assignments, End Exams

MTME-104 : Operations Management

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO1: Understand the concepts of operations management and various types of manufacturing systems & plant layouts with their characteristics, merits and demerits.	√	√	√	√	√			√	√	√	√	√	Understanding and Applying	Yes	Minor Exams, Assignments, End Exams
CO2: Learn about different types of planning and concepts of MACRO & MICRO process design.	√	√	√	√	√			√	√	√	√	√	Understanding and Applying	Yes	Minor Exams, Assignments, End Exams
CO3: Know about the concepts of demand forecasting, various demand patterns and qualitative and quantitative techniques of demand forecasting.	√	√	√	√	√			√	√	√	√	√	Understanding and Applying	Yes	Minor Exams, Assignments, End Exams
CO4: Understand the concept of aggregate production planning, different scheduling criteria and mutli-stage manufacturing systems.	√	√	√	√	√			√	√	√	√	√	Understanding and Applying	Yes	Minor Exams, Assignments, End Exams
CO5: Learn about various types of material flow and concepts of MRP, MRP-II, JIT and ERP along with their characteristics.	√	√	√	√	√			√	√	√	√	√	Understanding and Applying	Yes	Minor Exams, Assignments, End Exams

MTME-105 ADVANCED THERMODYNAMICS

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO1: Describe the various laws of thermodynamics and their applications.	√	√	√	√	√	√	√		√	√	√	√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO 2: Explain the concepts of availability and irreversibility with respect to reacting and nonreacting systems.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO 3: Describe methods in using equations of potentials, availability, and exergy for thermodynamic analysis.	√	√	√	√	√	√	√	√	√		√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams

CO 4: Analyse the direct energy conversion methods and their applications.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
MTME 201 RESEARCH METHODOLOGY															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO1: Formulate a research problem	√	√	√	√	√	√	√	√	√		√	√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO 2: Explain the different experimental designs and their analysis.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO 3: Apply different statistical tools for the research analysis	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO 4: Apply the research ethics	√		√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
MTME-202 Tribology															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO1: The student will be able to study research papers for understanding of a new field and summarise them.	√	√	√		√		√	√	√	√		√	Understand	Yes	Final Viva
CO2: Ability to identify promising new directions of various cutting edge technologies.		√	√	√	√		√	√	√		√	√	Applying and Designing	Yes	Final Viva
CO3:The student will be able to effectively communicate by making an oral presentation.	√		√	√	√	√	√	√		√	√		Applying and Designing	Yes	Final Viva
MTME-203: Modern Manufacturing Processes															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO1: Understand the importance and applications of advanced manufacturing processes	√	√	√				√		√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams
CO 2: Understand the working principle and theory of material removal of various advanced													Understanding	Yes	Minor Exams, Assignments, End Exams

machining processes	√	√	√				√		√	√	√	√	Understanding	Yes	Minor Exams Assignments, End Exams
CO 3: Determine the material removal rate and surface finish achieved by various advanced machining processes	√	√	√	√	√				√	√	√	√	Analysing	Yes	Minor Exams Assignments, End Exams
CO 4: Understand the different techniques to form the miniature product from metal powder	√	√	√	√			√		√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams
CO 5: Learn about Additive manufacturing such as 3-D printing	√	√	√	√			√		√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams

Paper MTME204 Computational Fluid Dynamics

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO1: Provide the student with a significant level of experience in the use of modern CFD software for the analysis of complex fluid-flow systems.															
CO 2: Improve the student's understanding of the basic principles of fluid mechanics.	√	√	√	√	√	√	√		√	√	√	√	Understanding	Yes	Lectures, Tutorials, Assignments, Powerpoint Presentations, Numericals etc
CO 3: Improve the student's research and communication skills using a self-directed, detailed study of a complex fluid-flow problem and to communicate the results in written form.	√	√	√	√	√	√	√		√	√	√	√	Applying	Yes	Lectures, Tutorials, Assignments, Powerpoint Presentations, Numericals etc

MTME –205: Advanced Welding Technology

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO1: Learn about the classification of various welding processes, welding defects and their	√	√	√	√	√	√	√		√	√	√	√	Understanding	Yes	Lectures, Tutorials, Assignments, Powerpoint Presentations, Numericals etc

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CO 2: Understand the terms weldability, soldering, brazing, welding symbols and safety and	√	√	√	√	√	√	√		√	√	√	√	Understanding	Yes	Lectures, Tutori Assignments, Powerpoint Presentations Numericals etc
CO 3: Understand the concept of various terms of welding arc such as arc efficiency, arc forces,	√	√	√	√	√	√	√		√	√	√	√	Understanding	Yes	Lectures, Tutori Assignments, Powerpoint Presentations Numericals etc
CO 4: Learn about the various types of welding electrodes, welding fluxes, shielding gases, AC and	√	√	√	√	√	√	√		√	√	√	√	Understanding	Yes	Lectures, Tutori Assignments, Powerpoint Presentations Numericals etc
CO 5: Learn about various advanced welding processes along with their advantages, limitations and	√	√	√	√	√	√	√		√	√	√	√	Understanding	Yes	Lectures, Tutori Assignments, Powerpoint Presentations Numericals etc
Advanced Material Characterization MTME-207-18															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO:1 apply appropriate characterization techniques for microstructure examination at different magnification level and use them to understand the microstructure of various materials	√	√	√	√	√		√	√	√	√	√		Understanding	Yes	Minor Exams, Qu demonstrations thr videos/ lab, End T Exams
CO:2 choose and appropriate electron microscopy techniques to investigate microstructure of materials at high resolution	√	√	√	√	√	√	√		√	√	√	√	Understanding	Yes	Minor Exams, Qu demonstrations thr videos/ lab, End T Exams
CO:3 determine crystal structure of specimen and estimate its crystallite size and stress	√	√	√	√	√		√		√	√	√	√	Applying	Yes	Minor Exams, Qu demonstrations thr videos/ lab, End T Exams
CO:4 apply thermal analysis techniques to determine thermal stability of and thermodynamic transitions of the specimen	√	√	√	√	√	√	√		√	√	√		Applying	Yes	Minor Exams, Qu demonstrations thr videos/ lab, End T Exams
Rapid Prototyping MTME-208															

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 1.	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tool Measure Attainment of CO
CO:1 Generating a good understanding of RP history, its development and applications. Expose the students to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering	√	√		√	√		√	√	√	√	√		Understanding	Yes	Minor Exams, Q demonstrations th videos/ lab, End Exams
CO:2 Students will be exposed to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering.	√	√		√	√	√	√		√	√	√		Understanding	Yes	Minor Exams, Q demonstrations th videos/ lab, End Exams
CO: 3 Students will understand steriolithography methods	√	√		√	√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Q demonstrations th videos/ lab, End Exams
CO:4 Students gain knowledge to develop prototypes using direct and indriect method of prototyping.	√	√	√	√	√	√	√		√	√			Understanding	Yes	Minor Exams, Q demonstrations th videos/ lab, End Exams

MTME-209: Advanced metal cutting

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tool Measure Attainment of CO
CO1: Overview of the principles of metal cutting	√	√	√			√	√		√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams
CO 2: Describe the methods of metal cutting	√	√	√			√	√		√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams
CO 3: Describe the cutting forces involved and their measurements	√	√	√	√			√		√	√	√	√	Understanding and Analysing	Yes	Minor Exams, Assignments, End Exams
CO 4: Describe the parameters effecting tool forces	√	√	√	√			√		√	√	√	√	Understanding and Analysing	Yes	Minor Exams, Assignments, End Exams
CO 5: Describe the theory/methods to find tool life.	√	√	√	√			√		√	√	√	√	Understanding and Analysing	Yes	Minor Exams, Assignments, End Exams

Paper MTME 210 Advanced Casting Processes

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 1..	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tool Measure Attainment of CO
CO1: Analyze and access the use of casting processes in manufacturing .	√	√	√	√	√	√	√			√	√	√	Understanding	Yes	Minor Exams, Q Assignments, End Exams
CO 2: Understand the working of various casting processes.	√	√	√	√	√	√	√			√	√	√	Understanding	Yes	Minor Exams, Q Assignments, End Exams
CO 3: To inculcate the principle, thermal and metallurgical aspects during solidification of metals & alloys.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Q Assignments, End Exams
CO 4: To impart knowledge about the principles/methods of casting with detailed design of gating/riser system needed for casting.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Q Assignments, End Exams
CO 5: To impart knowledge about defects in casting objects and requirements for achieving sound casting.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Q Assignments, End Exams

MTME–211 :Maintenance and Reliability Engineering

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tool Measure Attainment of CO
CO1: Understand the concepts of Maintenance, Reliability and Availability.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams
CO2: Establish maintenance strategies according to system characteristics and design transition	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams
programs to implement these strategies.	√	√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO3: Develop fault trees for a system and apply various reliability models on fault analysis.	√	√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO4: Develop hazard rate models to know the behaviour of components.	√	√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO5: Manage the manufacturing organisation with highest possible availability.	√	√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams

MTME–212 : Supply Chain Management

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tool Measure Attainment of CO
CO1: Understand the supply chain performance and supply chain drivers	√		√		√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams
CO2: Apply the concept of managing economies of scale in a supply chain and importance of transportation in a supply chain.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO3: Learn about the logistics and competitive strategy and measuring logistics costs for its performance.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO4: Apply the concepts of benchmarking in supply chain and coordination in a supply Chain.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO5: Identify the malfunctions in rotating machinery using vibration measurements.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams

MTME-214: Engineering Design Optimization

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tool Measure Attainment of CO
CO1: Describe different methods of optimization	√	√							√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams
CO 2: Model and formulate optimization problems in standard form and assess the optimality of a solution.	√	√	√	√	√				√	√	√	√	Understanding and Analysing	Yes	Minor Exams, Assignments, End Exams
CO 3: Determine the optimal solution for unconstrained and constrained problems of multiple variables.	√	√	√	√	√				√	√	√	√	Understanding and Analysing	Yes	Minor Exams, Assignments, End Exams
CO 4: Analyse the sensitivity of a solution to different variables.	√	√	√	√	√				√	√	√	√	Understanding and Analysing	Yes	Minor Exams, Assignments, End Exams
CO 5: Determine the advantages and disadvantages of applying different optimization															

techniques for a specific problem.	√	√	√	√					√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams
MTME-217 : Dynamics of Rotating Machines															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO1: Model the Rotor bearing systems and formulate the governing equations.	√	√	√	√	√		√			√	√	√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO2: Compute the critical speeds and stability limits.	√	√	√	√	√		√			√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO3: Compute the transient response of rotors.	√	√	√	√	√		√			√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO4: Predict the response of a rotor bearing system through analytical models.	√	√	√	√	√		√			√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO5: Identify the malfunctions in rotating machinery using vibration measurements.	√	√	√	√	√		√			√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
MTME-219 : Sustainable Design and Manufacturing															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO1: Understand the concepts of sustainability, sustainable development and linkages between technology and sustainability.	√		√		√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams
CO2: Understand the concept and different tools & techniques of sustainable manufacturing.	√	√	√		√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO3: Learn about different environmental standards and their requirement for sustainable development.	√	√	√		√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO4: Learn about various eco-friendly product design methods and multi-criteria decision															

making in sustainability.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO5: Understand the environmental, economic, societal and business indicators of sustainability.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams

MTME-220 Vibration and Noise Control

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO1: Understand the multi-degree freedom system and concept of free and forced vibrations	√	√	√		√		√	√		√	√		Understand	Yes	Minor Exams, Assignments, End Exams
CO2: Understand the implementation of different numerical methods of multi-degree system.		√		√	√		√	√	√		√	√	Understand	Yes	Minor Exams, Assignments, End Exams
CO3: Learn about the concepts regarding vibration of strings, bars, shafts and beams.	√		√	√	√		√	√	√	√	√		Understand	Yes	Minor Exams, Assignments, End Exams
CO4: Understand the concept of vibration control and measurement, vibration isolation, vibration exciters and vibration absorbers.	√	√	√		√	√	√		√	√		√	Understand	Yes	Minor Exams, Assignments, End Exams
CO5: Learn about fundamentals of noise measurement and noise control.	√	√	√		√	√	√		√	√		√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams

MTME-221 COMPOSITE MATERIALS

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO1: Describe the concept, need and applications of composite materials.	√	√		√	√	√	√		√	√	√	√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO 2: Solve the problem of effects of influencing factors on the strength of composite materials	√	√	√	√	√	√	√	√	√		√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
CO3: Demostrate the various manufacturing processes of the composites	√	√		√	√	√	√		√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams

CO 4:Suggest/select optimum combination of Matrix/Reinforcement for various engineering applications.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams Assignments, End Exams
Design of Steam Turbines MTME-224															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO:1 Students will be able to practice the basic concepts and working cycles for steam engines.	√	√	√	√	√	√	√	√	√	√	√		Understanding	Yes	Minor Exams, Q demonstrations th videos/ lab, End Exams
CO:2 Student will be able to design the blades and impeller for impulse and reaction turbines.	√	√	√	√	√		√	√	√	√	√	√	Applying	Yes	Minor Exams, Q demonstrations th videos/ lab, End Exams
CO:3 Student will be able to identify and make different types of condensers, cooling water calculations etc.	√	√	√	√	√	√		√	√	√		√	Applying	Yes	Minor Exams, Q demonstrations th videos/ lab, End Exams
MTME-225 Convective Heat Transfer															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO1: Development of 3D-unsteady (generalized) momentum, energy and mass transfer equations in the Cartesian system, representing them in tensor and vector notations, expandable to other coordinate systems.		√	√		√		√	√		√	√	√	Understand	Yes	Minor Exams, Assignments, End Exams
CO2: Development of generalized Integral form of Momentum and energy equations, identification of the displacement, momentum, conduction and enthalpy thicknesses, solutions for variable free stream velocities over curved surface and for flow over a body of arbitrary shape	√	√		√	√		√	√	√		√	√	Understand	Yes	Minor Exams, Assignments, End Exams
CO3: Analysis of momentum and energy boundary layers in pipe flows, identification of entrance and fully developed region during laminar flow, solution of energy differential equations for constant heat flux and constant wall temperature conditions	√		√	√	√		√	√	√	√	√		Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO4: Modelling of external and internal natural convective flows and estimates of heat transfer.	√	√	√		√	√	√		√	√		√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams

CO5: Knowledge of turbulent heat convection, rules to modify the laminar momentum and energy equations and develop equations for the turbulent flows.	√	√	√		√	√	√		√	√		√	Applying and Designing	Yes	Minor Exams Assignments, End Exams
CO6: Analyze heat exchanger performance by using the method of heat exchanger effectiveness.	√	√	√		√	√	√		√	√		√	Applying and Designing	Yes	Minor Exams Assignments, End Exams
Combustion Engineering MTME-226															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO: 1 Understand precisely a difference between premixed combustion and diffusion combustion.	√	√	√	√	√		√		√	√	√	√	Understanding	Yes	Minor Exams, Q demonstrations th videos/ lab, End Exams
CO:2 Learn combustion mechanisms of gaseous, liquid and solid fuels	√	√	√	√	√		√		√	√	√	√	Understanding	Yes	Minor Exams, Q demonstrations th videos/ lab, End Exams
CO: 3 Learn chemiluminescence phenomena of flame and the prevention method of air pollutant	√	√	√	√	√		√		√	√	√	√	Understanding	Yes	Minor Exams, Q demonstrations th videos/ lab, End Exams
MTME-227 Conductive & Radiative Heat Transfer															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainment of CO**
CO1: Calculate emission of thermal radiation from a black body or grey body.		√	√		√		√	√		√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO2: Calculation of view factor between two objects.	√	√		√	√		√	√	√		√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO3: Analyse simple radiation interchange between diffuse surfaces, radiation from a volume to a surface and an object with radiation, convection and conduction.	√		√	√	√		√	√	√	√	√		Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO4: Understand the fundamentals of convective heat transfer process.	√	√	√		√	√	√		√	√		√	Understand	Yes	Minor Exams, Assignments, End Exams
CO5: Analyze heat exchanger performance by using the method of heat exchanger effectiveness.	√	√	√		√	√	√		√	√		√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
MTME-229 Design of HVAC Systems															

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 1.	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tool Measure Attainment of CO
CO1: Describe the requirement specifications for indoor air quality, energy supply and energy use.	√	√	√		√		√	√		√	√		Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO2: Describe system solutions for renewable energy production and heat storage		√		√	√		√	√	√		√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO3: Describe system solutions for ventilation and tempering of rooms	√		√	√	√		√	√	√	√	√		Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO4: Describe solutions for domestic hot water supply, sewerage and preparation of domestic hot water methods	√	√	√		√	√	√		√	√		√	Understand	Yes	Minor Exams, Assignments, End Exams
CO5: Describe the components of HVAC system.	√	√	√		√	√	√		√	√		√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams
CO6: Describe the content of solutions for monitoring and control of air conditioning plants		√	√		√	√	√		√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Exams

Design and optimization of Thermal Systems MTME-230

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tool Measure Attainment of CO
CO:1 Integrate thermal component models and simulate a thermal system	√	√	√	√	√		√		√	√	√	√	Understanding	Yes	Minor Exams, Q demonstrations thr videos/ lab, End T Exams
CO:2 Perform an economic analysis of a thermal system.	√	√	√	√	√		√		√	√	√	√	Applying	Yes	Minor Exams, Q demonstrations thr videos/ lab, End T Exams
CO:3 Use the computer to solve thermal system models	√	√	√	√	√		√		√	√	√	√	Applying	Yes	Minor Exams, Q demonstrations thr videos/ lab, End T Exams
CO:4 Communicate thermal system designs both orally and in writing	√	√	√	√	√		√		√	√	√	√	Understanding	Yes	Minor Exams, Q demonstrations thr videos/ lab, End T Exams

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CO:5 Apply optimization procedures and design optimized thermal systems	√	√	√	√	√		√		√	√	√	√	Applying	Yes	Minor Exams, Q demonstrations th videos/ lab, End Exams
MTME–301 :Project															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Too Measure Attainm of CO**
CO1: Identify an engineering problem, devise a means of solving and exhibit the ability to execute the solution.	√	√	√	√	√	√	√	√	√		√	√	Understanding	Yes	Reports, Projec Presentations and Viva
CO2:Demonstrate knowledge of professional and ethical responsibilities	√		√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Projec Presentations and Viva
CO3:Formulate and implement innovative ideas for social and environmental benefits.	√	√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Projec Presentations and Viva
CO4:Write technical report of the project apart from developing a presentation.	√	√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Projec Presentations and Viva
CO5: Demonstrate an ability to present and defend their research work to a panel of experts.	√		√		√	√	√		√	√	√	√	Applying and Designing	Yes	Reports, Projec Presentations and Viva
Paper MTME404 Dissertation															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tool Measure Attainm of CO**
CO1: Demonstrate a depth of knowledge of Mechanical Engineering.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Field Project, Rep Making and Presentation
CO 2: Complete an independent research project, resulting in at least a thesis publication, and research outputs in terms of publications in high impact factor journals, conference proceedings, and patents	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Field Project, Rep Making and Presentation
CO 3: Demonstrate knowledge of contemporary issues in their chosen field of research.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Field Project, Rep Making and Presentation
CO4: Demonstrate an ability to present and defend their research work to a panel of experts.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Field Project, Rep Making and Presentation

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Research Methodology (Phd. Course Work)

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Formulate a research problem	√	√	√	√	√	√	√	√	√		√	√	Understand	Yes	Minor Exams, Assignments, En Term Exams
CO 2: Explain the different experimental designs and their analysis.	√	√	√	√	√	√	√	√	√	√	√	√	Understand	Yes	Minor Exams, Assignments, En Term Exams
CO 3: Apply different statistical tools for the research analysis	√	√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, En Term Exams
CO 4: Apply the research ethics	√		√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Assignments, Presentations an Final Viva

Non Conventional Machining (PhD Course Work)

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measu Attainment of CO
CO1: Understand the need of Non Conventional Machining Processes and able to Classify various processes.	√	√	√		√		√	√	√	√		√	Understand	Yes	Minor Exams, Assignments, En Term Exams
CO2: Recognize the role of mechanical energy in non-Conventional machining processes.		√		√			√	√	√		√	√	Understand	Yes	Minor Exams, Assignments, En Term Exams
CO3: Apply the knowledge on machining electrically conductive material through electrical energy in non-Conventional machining processes.	√		√	√		√	√	√		√	√		Applying and Designing	Yes	Minor Exams, Assignments, En Term Exams
CO4: Understand the concept of machining the hard material using chemical energy andelectrochemical energy.		√	√				√	√	√	√		√	Applying and Designing	Yes	Assignments, Presentations an Final Viva
CO5: Apply the knowledge on machining electrically conductive material through electrical energy in non-Conventional machining processes.		√	√		√		√	√	√	√		√	Applying and Designing	Yes	Minor Exams, Assignments, En Term Exams

CO6: Familiarity and application of various thermal energy based non-conventional machining processes.	√		√	√	√	√	√	√	√	√		√	Applying and Designing	Yes	Minor Exams, Assignments, End Term Exams
PhD Paper Presentation/Seminar															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1: Deal with nerves and think more positively about public speaking.	√	√	√		√	√	√	√	√	√	√	√	Thinking	Yes	Field based assignments, Report making, presentations etc.
CO 2: Consider ways of grabbing the listener's attention, holding their interest, and concluding strongly.	√		√			√	√	√	√	√	√	√	Thinking	Yes	Field based assignments, Report making, presentations etc.
CO3: Use body language and tone of voice to enhance their presentations.			√		√	√	√	√	√	√	√	√	Applying	Yes	Field based assignments, Report making, presentations etc.
CO4: Use slides and visual aids effectively.	√	√	√		√	√	√	√	√	√	√	√	Applying	Yes	Field based assignments, Report making, presentations etc.
CO5: Deliver an enthusiastic and well-practised presentation.	√	√	√		√	√	√	√	√	√	√	√	Applying	Yes	Field based assignments, Report making, presentations etc.
Advanced Heat Transfer															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measure Attainment of CO**
CO1: Understand the principles of heat transfer through conduction, convection and radiation modes.	√	√	√		√	√	√		√	√	√	√	Thinking	Yes	Field based assignments, Report making, presentations etc.
CO2: Understand the heat transfer during phase-change processes, such as boiling and condensation.	√	√	√			√		√	√	√	√	√	Thinking	Yes	Field based assignments, Report making, presentations etc.
CO3: Understand the practical aspects of the theories of heat transfer, such as design of heat exchangers.	√		√		√	√	√	√	√		√	√	Applying	Yes	Field based assignments, Report making, presentations etc.
CO4: Understand the concept related to mass transfer and its connection with heat transfer.		√	√		√	√	√	√		√	√	√	Applying	Yes	Field based assignments, Report making, presentations etc.

CO5: Carry out laboratory tests verifying the various principles of heat transfer.		√	√		√	√	√	√	√	√		√	Applyin_	Yes	Field based assignments, Repor making, presentations etc.
Advanced Fluid Mechanics and CFD															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measur Attainment of CO**
CO1: Understand the concept of computational fluid dynamics, modeling and simulation.	√	√	√		√	√	√		√		√	√	Understanding	Yes	Field based assignments, Repor making, presentations etc.
CO2: Learn about the different governing equations of fluid dynamics.	√		√					√	√	√	√	√	Thinking	Yes	Field based assignments, Repor making, presentations etc.
CO3: Understand the concept of parabolic, elliptic and hyperbolic equations and various			√		√	√	√	√	√		√	√	Applying	Yes	Field based assignments, Repor making, presentations etc.
methods of finite differencing and stability.		√	√		√	√	√	√		√	√	√	Understanding	Yes	Field based assignments, Repor making, presentations etc.
CO4: Understand the concept of turbulence, error and uncertainty & different turbulent	√	√	√		√	√	√		√	√			Applying	Yes	Field based assignments, Repor making, presentations etc.
Finite Elements Methods															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measur Attainment of CO**
CO1: To obtain an understanding of the fundamental theory of the FEA method;	√		√	√	√	√	√		√	√	√	√	Thinking	Yes	Field based assignments, Repor making, presentations etc.
CO2: To develop the knowledge of mathematics and engineering in solving the problems related to structural and heat transfer.	√		√			√		√	√	√	√	√	Designing	Yes	Field based assignments, Repor making, presentations etc.
CO3: To identify the application and characteristics of FEA elements such as bars, beams, plane and isoparametric elements		√	√	√	√	√	√	√	√			√	Applying	Yes	Field based assignments, Repor making, presentations etc.

CO4: To understand the application and use of the FE method for heat transfer problems		√	√	√	√	√	√	√		√	√	√	Understanding	Yes	Field based assignments, Repor making, presentations etc.
CO5: Use the commercial FEA packages like ANSYS and modern CAD/CAE tools for solving real life structural problems.	√	√	√		√	√	√	√	√	√		√	Applying	Yes	Field based assignments, Repor making, presentations etc.
Composite Materials															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measur Attainment of CO**
CO1: Describe the concept, need and applications of composite materials.			√	√	√	√	√		√	√	√	√	Thinking	Yes	Field based assignments, Repor making, presentations etc.
CO 2: Solve the problem of effects of influencing factors on the strength of composite materials	√		√			√		√	√	√	√	√	Designing	Yes	Field based assignments, Repor making, presentations etc.
CO3: Demonstrate the various manufacturing processes of the Metal/ ceramic/polymer-based composites.	√	√	√	√	√	√	√	√	√		√	√	Applying	Yes	Field based assignments, Repor making, presentations etc.
CO 4: Test and characterize the composite and suggest secondary processing as per application.	√	√	√		√	√	√	√		√	√	√	Understanding	Yes	Field based assignments, Repor making, presentations etc.
Optimization Techniques															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measur Attainment of CO**
CO1: Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems	√		√	√	√	√	√		√	√	√	√	Thinking	Yes	Field based assignments, Repor making, presentations etc.
CO2: Ability to go in research by applying optimization techniques in problems of Engineering and Technology		√	√			√		√	√	√	√	√	Designing	Yes	Field based assignments, Repor making, presentations etc.

CO3: Ability to solve the mathematical results and numerical techniques of optimization theory to concrete Engineering problems by using computer software.	√	√	√	√	√	√	√	√	√		√	√	Applying	Yes	Field based assignments, Repor making, presentations etc.
Computer Aided Design and Manufacturing (CAD/CAM)															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measur Attainment of CO**
CO1: Apply/develop solutions or to do research in the areas of Design and simulation in Mechanical Engineering.	√	√	√	√	√	√	√		√	√	√	√	Understand	Yes	Field based assignments, Repor making, presentations etc.
CO2: Have abilities and capabilities in developing and applying computer software and hardware to mechanical design and manufacturing fields.	√	√	√			√		√	√	√	√	√	Understand	Yes	Field based assignments, Repor making, presentations etc.
CO3: Review and document the knowledge developed by scholarly predecessors and critically assess the relevant technological issues.			√	√	√	√	√	√	√		√	√	Applying and Designing	Yes	Field based assignments, Repor making, presentations etc.
CO4: Formulate relevant research problems; conduct experimental and/or analytical study and analyzing results with modern mathematical/scientific methods and use of software tools.		√	√	√	√	√	√	√		√	√	√	Applying	Yes	Field based assignments, Repor making, presentations etc.
Advanced Theory of Vibrations															
Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measur Attainment of CO**
CO1: Recognize the need and measurement of vibration in mechanical systems	√		√	√		√	√		√	√	√	√	Understand	Yes	Field based assignments, Repor making, presentations etc.
CO2: Suggest suitable methods of vibration reduction and absorption	√	√	√			√		√	√	√	√	√	Understand	Yes	Field based assignments, Repor making, presentations etc.

CO3: Calculate natural frequencies of vibrations		√	√	√		√	√	√	√		√	√	Applying and Designi	Yes	Field based assignments, Repor making, presentations etc.
CO4: Distinguish between systems with different degrees of vibration	√	√	√	√		√	√	√		√	√	√	Applying	Yes	Field based assignments, Repor making, presentations etc.

Tribology

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measur Attainment of CO
CO1: Be able to know the field of tribology.	√	√	√	√	√	√			√	√	√	√	Understand	Yes	Field based assignments, Repor making, presentations etc.
CO2: Be able to know the surface, properties of surface and related instruments	√	√	√		√	√		√	√	√	√	√	Understand	Yes	Field based assignments, Repor making, presentations etc.
CO3: Be able to understand the friction, friction theory and behaviour of metals and non-metals			√	√	√	√		√	√		√	√	Applying and Designing	Yes	Field based assignments, Repor making, presentations etc.
CO4: Be able to understand wear processes, wear theory, behaviour of metals and non-metals and different instruments	√	√	√	√		√	√	√		√	√	√	Applying	Yes	Field based assignments, Repor making, presentations etc.

Thermo Economics and Power Plants

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measur Attainment of CO
CO1: Understand and know the requirements for a Thermal Power Plant and Nuclear Power Plant, from sources to consumption and economics of power plants	√		√	√	√	√	√	√	√	√	√	√	Thinking	Yes	Field based assignments, Report making, presentations etc.
CO2: Study and learn the processes and cycles followed in Thermal Power Plants and nuclear power plants and components used in the power plants.	√	√	√		√	√		√	√	√	√	√	Thinking	Yes	Field based assignments, Report making, presentations etc.

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CO3: Apply the knowledge gained by analyzing the steam power plants, steam generators and gas turbine power plants, to improve the efficiency and reduce the thermal losses.		√	√	√	√	√		√	√		√	√	Applying	Yes	Field based assignments, Repor making, presentations etc.
CO4: Apply the knowledge in calculating the Power Load Calculations and Distribution.	√	√	√	√		√	√	√		√	√	√	Applying	Yes	Field based assignments, Repor making, presentations etc.

Advanced Thermodynamics

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measur Attainment of CO
CO1: Describe the various laws of thermodynamics and their applications	√	√		√	√	√	√		√	√	√	√	Understand	Yes	Field based assignments, Repor making, presentations etc.
CO 2: Explain the concepts of availability and irreversibility with respect to reacting and nonreacting systems.					√	√			√	√	√	√	Understand	Yes	Field based assignments, Repor making, presentations etc.
CO 3: Describe methods in using equations of potentials, availability, and exergy for thermodynamic analysis.	√	√		√	√	√			√		√	√	Applying and Designing	Yes	Field based assignments, Repor making, presentations etc.
CO 4: Explain the behaviour of gases and chemical equilibrium.	√	√		√		√	√			√	√	√	Applying	Yes	Field based assignments, Repor making, presentations etc.

Presentation/Seminar

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measur Attainment of CO
CO1: Deal with nerves and think more positively about public speaking.		√	√	√	√	√	√		√	√	√	√	Thinking	Yes	Field based assignments, Repor making, presentations etc.
CO 2: Consider ways of grabbing the listener's attention, holding their interest, and concluding strongly.	√				√	√			√	√	√	√	Thinking	Yes	Field based assignments, Repor making, presentations etc.
CO3: Use body language and tone of voice to enhance their presentations.	√	√	√	√	√	√			√		√	√	Applying	Yes	Field based assignments, Repor making, presentations etc.

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CO4: Use slides and visual aids effectively.	√	√	√	√		√	√			√	√	√	Applyir	Yes	Field based assignments, Repor making, presentations etc.

Production Engineering

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measur Attainment of CO
CO1: Understand the various Conventional and Non-Conventional machining processes	√		√	√	√		√		√	√	√	√	Understand	Yes	Field based assignments, Repor making, presentations etc.
CO2: Learn about measuring equipment, error types and their evaluation	√	√	√	√	√				√	√	√	√	Understand	Yes	Field based assignments, Repor making, presentations etc.
CO3: Learn about process capability and six sigma		√	√	√	√				√		√	√	Applying and Designing	Yes	Field based assignments, Repor making, presentations etc.
CO4: Learn about quality control and quality assurance systems	√	√	√	√			√			√	√	√	Applying	Yes	Field based assignments, Repor making, presentations etc.

Advanced Mechanics of Solids

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measur Attainment of CO
CO1: Understand concepts of stress and strain in solids and associated theories of failure.	√		√	√	√		√		√	√	√	√	Understand	Yes	Field based assignments, Repor making, presentations etc.
CO2: Derive governing equations to solve engineering problem.	√	√			√				√	√	√	√	Understand	Yes	Field based assignments, Repor making, presentations etc.
CO3: Apply analysis techniques to determine stress in components such as shafts, beams, shells and rotating discs under different loading conditions.		√	√	√	√				√		√	√	Applying and Designing	Yes	Field based assignments, Repor making, presentations etc.
CO4: Analyze deformations in beam and locate shear centre in thin-walled beams.	√	√	√	√			√			√	√	√	Applying	Yes	Field based assignments, Repor making, presentations etc.

Mechatronics

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measur Attainment of CO

CO1: Each individual should develop competence in technologies of automation.	√	√	√		√		√	√	√	√	√	√	Thinki	Yes	Field based assignments, Repo making, presentations etc.
CO2: Capable to develop simple control systems and study the system response.	√	√			√			√	√	√	√	√	Thinking	Yes	Field based assignments, Repo making, presentations etc.
CO3: Individual should be able to understand the communication system in automation		√	√	√	√						√	√	Applying	Yes	Field based assignments, Repo making, presentations etc.
CO4: Analyze deformations in beam and locate shear centre in thin-walled beams.	√		√	√			√	√	√	√	√	√	Applying	Yes	Field based assignments, Repo making, presentations etc.

Product Design and Development

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO 6**	**PO 7**	**PO 8**	**PO 9**	**PO 10**	**PO 11**	**PO 12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
CO1: To introduce the objects of product design and requirements of a good product design.		√	√	√	√	√	√	√	√	√	√	√	Understand	Yes	Field based assignments, Repo making, presentations etc.
CO2: Knowledge of different design principles like designing for function, production, installation and handling, maintenance, packing etc.	√	√			√	√		√	√	√	√	√	Understand	Yes	Field based assignments, Repo making, presentations etc.
CO3: Knowledge and use of latest CAD/CAM/CAE software for different design and development functions.	√	√	√	√	√	√					√	√	Applying and Designing	Yes	Field based assignments, Repo making, presentations etc.

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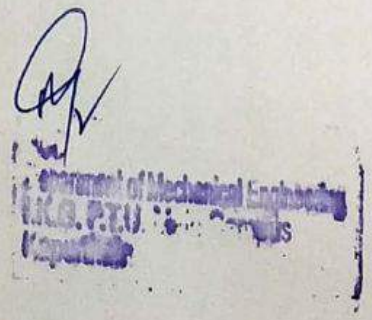
PROGRAM OUTCOMES (PO'S)

S. No.	Programme Outcomes	Description
01	Engineering knowledge	Apply basic knowledge of mathematics, science and engineering fundamentals and engineering specializations to the solution of complex engineering problems
02	Problem analysis	Identify, formulate, research literature and analyse complex problems reaching substantiated conclusions using first principles of mathematics, natural sciences and engineering sciences.
03	Design/ Development of solutions	Design solutions for complex engineering problems and design system components or processes that meet specific needs with appropriate consideration for public health and safety, cultural, societal and environmental considerations.
04	Conduct	Investigations of complex problems using research-based and research methods including design of experiments, analysis, and interpretations of data and synthesis of information to provide valid conclusions.
05	Modern tool Usage	Create, select and apply appropriate techniques, resources and modern engineering and IT tools including predictions and modelling to complex engineering activities with an understanding of the limitations.
06	The Engineer and Society	Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.
07	Environment and Sustainability	Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate knowledge of and need for sustainable development.
08	Ethics	Apply ethical principles and commit to professional ethics and responsibilities of norms of engineering practice.
09	Individual and team work	Function effectively as an individual, and as a member or leader in diverse team and in multi-disciplinary settings.
10	Communication	Communicate effectively on complex engineering activities with the engineering community and with society at large, such as being able to comprehend and with effective reports and design documentation, make effective presentation and receive clear instructions.
11	Project management and Finance	Demonstrate knowledge and understanding of engineering and management principles and apply these to one's own work, as a member and leader in a team manage projects and in multidisciplinary environments .
12	Life-long learning	Recognise the need for and have the preparation and ability to Engage in independent and life-long learning in the broadcast context of technologies.

PROGRAM SPECIFIC OUTCOMES:

- Analyze, design and develop machining systems to solve the engineering problems by integrating thermal, design and manufacturing domains of mechanical engineering.
- Adopt a multidisciplinary approach to solve real-world industrial problems



Name of the Department: Mechanical Engineering

BTPHXX-18 - Physics & Physics Lab

Course Outcome

CO1: To be able to understand the basic principles of Quantum mechanics and to apply these to the complex phenomenon of matter radiation interaction

CO 2: To be able to understand the concept of wave packets using Heisenberg's uncertainty principle.

CO 3: To be able to apply Schrodinger's wave equations to study the complex physical phenomenon.

CO 4: To be able to understand the structure of crystalline solids by applying knowledge of crystallography.

CO 5: To be able to understand semiconducting materials by using the concepts of band theory of solids.

BTAMXX-18 - Maths-1

Course Outcome

CO1:Students will be able to remember terminologies and formulae in matrices, complex

CO2: Students will be able to understand and interpret the concepts of matrices, complex

CO3:Students will be able to compare and analyze the methods in matrices, complex numbers

BTEE101-18 Basic Electrical Engineering

Course Outcome

CO1: Have the knowledge of DC circuits, AC Circuits, basic magnetic circuits, working principles of electrical machines, and components of low voltage electrical installations

CO 2: Be able to analyze of DC circuits, AC Circuits

CO 3: Understand the basic magnetic circuits and apply it to the working of electrical machines

CO 4: Be introduced to types of wiring, batteries, and LT switchgear.

BTEE101-18 Basic Electrical Engineering Lab

Course Outcome

CO1: The ability to use common electrical measuring instruments and understand the fundamentals of electrical engineering.

CO 2: The ability to make electrical connections, and measure power, power factor using appropriate equipments.

CO 3: Have the knowledge of electrical machines, components and their ratings

CO 4: Understand the operation of transformers and electrical machines

Paper BTME101-18 Engineering Graphics & Design

Course Outcome

CO1: design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability, and sustainability.

CO 2: to prepare to communicate effectively.

CO 3: to prepare to use the techniques, skills, and modern engineering tools necessary for engineering practice.

BMPD101-18 Mentoring and professional Development

Course Outcome

CO1: The student will be able to effectively communicate and present technical material.

CO2: Ability to think critically and creatively to generate innovative and optimum solutions.

CO3:The student will be able to identify, evaluate and synthesise information from a range of sources to optimise process engineering design and development.

CO4: Engage in continuous education, training and research, and take control of their own learning and overall development.

BTCH101-18 - Chemistry -1

Course Outcome

Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.

Rationalise bulk properties and processes using thermodynamic considerations.

Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.

Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.

List major chemical reactions that are used in the synthesis of molecules.

BTCH102-18 - Chemistry Lab

Course Outcome

Estimate rate constants of reactions from concentration of reactants/products as a function of time

Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc

Synthesize a small drug molecule and analyse a salt sample

BTAMXX-18 Mathematics II

Course Outcome

CO1: The mathematical tools needed in evaluating multiple integrals and their usages.

CO 2: The effective mathematical tools for the solutions of differential equations that model physical processes.

CO 3: The tools of differentiation and integration of functions that are used in various techniques dealing engineering problems.

BTPS101-18 Programming for Problem Solving

Course Outcome

To formulate simple algorithms for arithmetic and logical problems.

To translate the algorithms to programs (in C language).

To test and execute the programs and correct syntax and logical errors.

To implement conditional branching, iteration and recursion.

To decompose a problem into functions and synthesize a complete program using divide and conquer approach.

To use arrays, pointers and structures to formulate algorithms and programs.

To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.

To apply programming to solve simple numerical method problems, namely rot finding of function, differentiation of function and simple integration.

BTPS102-18 Programming for Problem Solving Lab

Course Outcome

To formulate the algorithms for simple problems

To translate given algorithms to a working and correct program

To be able to correct syntax errors as reported by the compilers

To be able to identify and correct logical errors encountered at run time

To be able to write iterative as well as recursive programs

To be able to represent data in arrays, strings and structures and manipulate them through a program

To be able to declare pointers of different types and use them in defining self referential structures.

To be able to create, read and write to and from simple text files.

Paper BTMP 101-18 Workshop/Manufacturing Practices

Course Outcome

CO1: gain knowledge of the different manufacturing processes which are commonly employed in the industry, to fabricate components using different materials.

CO 2: able to fabricate components with their own hands.

CO 3: Get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes.

CO 4: By assembling different components, they will be able to produce small devices of their interest.

Paper BTHU101-18 English

Course Outcome

The objective of the course is to help the students become the independent users of English language.

Students will acquire basic proficiency in reading & listening, comprehension, writing and speaking skills.

Students will be able to understand spoken and written English language, particularly the language of their chosen technical field.

They will be able to converse fluently.

Paper BTHU102-18 English Lab

Course Outcome

The objective of the course is to help the students become the independent users of English language.

Students will acquire basic proficiency in listening and speaking skills.
Students will be able to understand spoken English language, particularly the language of their chosen technical field
They will be able to converse fluently

BMPD101-18 Mentoring and professional Development

Course Outcome

CO1: The student will be able to effectively communicate and present technical material.
CO2: Ability to think critically and creatively to generate innovative and optimum solutions.
CO3:The student will be able to identify, evaluate and synthesise information from a range of sources to optimise process engineering design and development.
CO4: Engage in continuous education, training and research, and take control of their own learning and overall development.

Paper BTME301-18 Fluid Mechanics

Course Outcome

CO1: Understand the concept of fluids and their properties.
CO 2:Apply the concept to solve the problems related to statics, dynamics and kinematics
CO3: Use and apply dimensional analysis and similitude techniques to various physical
CO4: Distinguish various types of flows and learn flow measurement methods.

BTME302-18 Theory of Machines -1

Course Outcome

CO1: Understand constructional and working features of important machine elements.
CO2: Design belt, rope and chain drives for transmission of motion from one shaft to
CO3: Identify different Cam and follower pairs for different applications and construct cam
CO4: Understand the function of brakes, dynamometers, flywheel and governors.

BTME303-18 : Machine Drawing

Course Outcome

CO1: Read, draw and interpret the machine drawings and related parameters.
CO2: Use standards used in machine drawings of machine components and assemblies.
CO3: Learn the concept of limits, fits and tolerances in various mating parts.
CO4: Visualize and generate different views of a component in the assembly.
CO5: Use CAD tools for making drawings of machine components and assemblies.

BTME304-18 STRENGTH OF MATERIALS-I

Course Outcome

CO1: Understand the concepts of stress and strain at a point, in the members subjected to axial, bending, torsional loads and temperature changes.
CO 2: Determine principal stresses, maximum shearing stress and their angles, and the stresses acting on any arbitrary plane within a structural element.
CO 3: Find bending moment and shear force over the span of various beams subjected to different kinds of loads.
CO 4: Calculate load carrying capacity of columns and struts and their buckling strength.
CO 5: Evaluate the slope and deflection of beams subjected to loads.

BTME305-18 Basic Electronics Engineering

Course Outcome

Understand construction of diodes and their rectifier applications.
Appreciate the construction and working bipolar junction transistors and MOSFETs.
Design Op-Amp IC based fundamental applications.

Paper Basic Thermodynamics BTME 305-18

Course Outcome

CO1: Apply energy balance to Systems and Control Volumes in situations involving heat and work interactions.
CO2: Evaluate changes in thermodynamic properties of substances
CO3:Evaluate performance of energy conversion devices
CO4:Explain and apply various gas power and vapor power cycles

BTME306-18 Strength of Material Lab

Course Outcome

CO1: Measure the various mechanical properties such as tensile and compressive strength, impact strength, torsion strength and fatigue strength and hardness of brittle and ductile

CO 2: Calculate load carrying capacity of long columns and their buckling strength.

BTME307-18 Theory of Machines Lab

Course Outcome

CO1: Understand constructional and working features of important machine elements.

CO2: Design belt, rope and chain drives for transmission of motion from one shaft to another

CO3: Identify different Cam and follower pairs for different applications and construct cam profile for required follower motion.

CO4: Understand the function of brakes, dynamometers, flywheel and governors.

Paper BTME308-18 Fluid Mechanics Lab

Course Outcome

CO1: Distinguish various type of flows and flow measurement methods and concept of statics and dynamics of liquids.

CO 2: Determine discharge and head loss, hydraulic and friction coefficient, for different types of flow in pipe and open channels.

BMPD301-18 Mentoring and professional Development

Course Outcome

CO1: The student will be able to effectively communicate and present technical material.

CO2: Ability to think critically and creatively to generate innovative and optimum solutions.

CO3:The student will be able to identify, evaluate and synthesise information from a range of sources to optimise process engineering design and development.

CO4: Engage in continuous education, training and research, and take control of their own learning and overall development.

BTME401-18 APPLIED THERMODYNAMICS

Course Outcome

CO1: Explain the functioning and performance evaluation of reciprocating air compressors.

CO 2: Analyze the combustion phenomenon in boilers and I.C. engines.

CO 3: Use of Steam Tables and MollierChart to solve vapour power cycle problems.

CO 4: Demostrate the constructional features and working of steam power plants and to evaluate their performance.

Paper BTME 402-18 Fluid Machines

Course Outcome

CO1: Determine discharge and head loss, hydraulic and friction coefficient, for different types of flow in pipe and open channels.

CO 2:Know about constructional details, working and design aspects of runner/wheel and evaluate the performance of various turbines like Pelton, Kaplan and Francis.

CO 3: Know about constructional details, working and evaluate the performance of centrifugal pump under different vane shape conditions.

CO 4: Know about constructional details, working and evaluate the performance of reciprocating pump and evaluate the effect of various deviations from the ideal

CO5: Know about constructional details and working of hydraulic devices like fluid coupling, accumulator and intensifier.

BTME403-18 STRENGTH OF MATERIALS-II

Course Outcome

CO1: Understand the concepts of stress and strain at a point, in the members subjected to axial, bending, torsional loads and temperature changes.

CO 2: Determine principal stresses, maximum shearing stress and their angles, and the stresses acting on any arbitrary plane within a structural element.

CO 3: Find bending moment and shear force over the span of various beams subjected to different kinds of loads.

CO 4: Calculate load carrying capacity of columns and struts and their buckling strength.

CO 5: Evaluate the slope and deflection of beams subjected to loads.

BTME404-18 MATERIALS ENGINEERING

Course Outcome

CO1: Illustrate the significance of structure-property-correlation for engineering materials including ferrous and non-ferrous.
CO 2: Explain the use and importance of various heat treatment processes used for engineering materials and their practical applications.
CO 3: Identify the various structural changes occurred in metals with respect to time temperature transformations.
CO 4: Interpret the significance of Fe-C and TTT diagram for controlling the desired structure and properties of the materials.
BTME405-18 : Theory of Machines -II
Course Outcome
CO1: Understand the basic concepts of inertia forces & couples applied to reciprocating parts of a machine.
CO2: Understand balancing of rotating and reciprocating parts of machines.
CO3: Select suitable type of gears for different application and analyse the motion of different elements of gear trains.
CO4: Understand the concept and application of gyroscopic effect.
CO5: Gain knowledge of kinematic synthesis.
EVS101-18 ENVIRONMENTAL SCIENCE
Course Outcome
Students will enable to understand environmental problems at local and national level through literature and general awareness.
The students will gain practical knowledge by visiting wildlife areas, environmental institutes and various personalities who have done practical work on various environmental Issues.
The students will apply interdisciplinary approach to understand key environmental issues and critically analyze them to explore the possibilities to mitigate these problems.
Reflect critically about their roles and identities as citizens, consumers and environmental actors in a complex, interconnected world
BTME406-18 APPLIED THERMODYNAMICS Lab
Course Outcome
CO1: Explain the functioning and performance evaluation of reciprocating air compressors.
CO 2: Analyze the combustion phenomenon in boilers and I.C. engines.
CO 3: Use of Steam Tables and MollierChart to solve vapour power cycle problems.
CO 4: Demostrate the constructional features and working of steam power plants and to evaluate their performance.
Paper BTME407-18 Fluid Machines Lab
Course Outcome
CO1: Conduct experiments on scaled down models or on actual size hydraulic machines and evaluate results in terms of unit or specific quantities for comparison purpose.
CO 2: Understand the working of various hydraulic machines (turbines and pumps) and can suggest remedial solutions for various faults.
Paper BTME408-18 Material Engineering Lab
Course Outcome
Analyse the microstructure of different ferrous and non-ferrous samples.
Explore the effect of heat treatment on various engineering materials by analysing its microstructure and hardness
BMPD401-18 Mentoring and professional Development
Course Outcome
CO1: The student will be able to effectively communicate and present technical material.
CO2: Ability to think critically and creatively to generate innovative and optimum solutions.
CO3:The student will be able to identify, evaluate and synthesise information from a range of sources to optimise process engineering design and development.
CO4: Engage in continuous education, training and research, and take control of their own learning and overall development.
BTME501-18 Heat Transfer
Course Outcome
To teach students the basic principles of conduction, radiation, and convection heat transfer. Students will demonstrate an understanding of the basic concepts of conduction, radiation, and convection heat transfer.
To extend the basic principle of conservation of energy to systems that involve conduction, radiation, and heat transfer. Students will demonstrate an understanding of the concept of conservation of energy and its application to problems involving conduction, radiation, and/or convection heat transfer. This principle will be used to formulate appropriate mathematical models and associated thermal boundary conditions.
To train students to identify, formulate, and solve engineering problems involving conduction heat transfer. Students will demonstrate the ability to formulate practical conduction heat transfer problems by transforming the physical system into a mathematical model, selecting an appropriate solution technique, and evaluating the significance of results.

To train students to identify, formulate, and solve engineering problems involving forced convection heat transfer, natural convection heat transfer, and heat exchangers. Students will demonstrate the ability to formulate practical forced and natural conduction heat transfer problems by transforming the physical system into a mathematical model, selecting an appropriate solution technique, and evaluating the significance of results. Students will also demonstrate an ability to analyze the performance of heat exchangers.

To train students to identify, formulate, and solve engineering problems involving radiation heat transfer among black surfaces and among diffuse gray surfaces. Students will demonstrate the ability to formulate practical radiation heat transfer problems by transforming the physical system into a mathematical model, selecting an appropriate solution

BTME502-18 : Design of Machine Elements

Course Outcome

CO1: Demonstrate recalling and applying knowledge of Basic Sciences, Graphics & Drawing, Basic Manufacturing Processes and Material Science, for design procedures of various Mechanical components.

CO2: Comprehend the effect of different stresses and strains under various loading conditions on the mechanical components and identify the mechanism/mode of failure.

CO3: Examine and solve design problems involving machine elements on the basis of various theories of failure.

CO4: Synergize forces, moments and strength information to develop ability to analyze, design and/or select machine elements aiming for safety, reliability, and sustainability.

Paper BTME 503-18 Manufacturing Processes

Course Outcome

CO1: Understand the different conventional manufacturing methods employed for making different products.

CO 2: Understand the different unconventional manufacturing methods employed for making different products.

Paper BTME 503-18 Management & Engineering Economics

Course Outcome

CO1: Explain the development of management and the role it plays at different levels in an organization.

CO 2: Comprehend the process and role of effective planning, organizing and staffing for the development of an organization.

CO 3: Understand the necessity of good leadership, communication and coordination for establishing effective control in an organization.

CO 4: Understand engineering economics demand supply and its importance in economics decision making and problem solving.

CO 5: Calculate present worth, annual worth and IRR for different alternatives in economic decision making.

CO 6: Understand the procedure involved in estimation of cost for a simple component, product costing and depreciation, its methods.

Paper BTME 503-18 Heat Transfer Lab

Course Outcome

Design and fabricate the experimental setups related to heat transfer phenomena.

Measure and analyse different heat transfer parameters.

Paper BTME 506-18 Manufacturing Processes Laboratory

Course Outcome

CO1: Determine/calculate the clay content, moisture content, hardness, permeability and grain fineness number of moulding sand sample.

CO 2: Use oxy-acetylene gas welding, manual arc welding, MIG, TIG and spot-welding processes to make various joints.

CO 3: Use machine tools such as lathe, shaper and milling machine for machining/cutting various profiles on work pieces.

CO 4: Learn about the constructional features and working of grinding machines, hydraulic press, draw bench, rolling mills, drawing and extrusion equipment.

Paper BTME 507-18 Numerical Methods Lab

Course Outcome

Understand different implementation modes of numerical methods.

Use the numerical methods with the understanding of limitations of these methods for solving problems.

Develop and implement their own computer programs.

Solve problems more accurately and efficiently in low computational time.

Handle the problems conveniently which are difficult to deal with manually

Paper BTMC102-18 ESSENCE OF INDIAN KNOWLEDGE TRADITION

Course Outcome

Understand the Philosophy of Indian Knowledge system and and its Basic Structure.

Understand the Ancient India Culture, Society and Religion.

Examine the areas of Indian Linguistic Tradition.

Know the contrubtion of scientists of different eras.
Handle the problems conveniently which are difficult to deal with manually

Paper BTME 409-18 4 weeks industrial training

Course Outcome

Capability to acquire and apply fundamental principles of engineering.
Become master in one's specialized technology
Become updated with all the latest changes in technological world.
Ability to communicate efficiently.
Knack to be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills.
Ability to identify, formulate and model problems and find engineering solution based on a systems approach.
Capability and enthusiasm for self-improvement through continuous professional development and life-long learning
Awareness of the social, cultural, global and environmental responsibility as an engineer.

BTME601-18 REFREGERATION AND AIR CONDITIONING

Course Outcome

CO1: Understand the fundamental principles and applications of refrigeration and air conditioning system
CO2: The students will be able to obtain cooling capacity and coefficient of performance by conducting test on refrigeration systems
CO3: The students will develop ability to calculate the energy requirements of cooling and heat equipment for air conditioning applications.
CO4: The students will be able to Explain the properties, applications and enironmental issues of different refrigerants.
CO5: The students can demonstrate an ability to analysis psychrometric processes and cycles of air conditioning systems.

Paper BTME602-18 Mechanical Measurements & Metrology

Course Outcome

CO1: To provide a knowledge about measurement systems and their components
CO 2: To learn about various sensors and transducers used for measurement of mechanical quantities
CO 3: To learn about usage of various measuring instruments.
CO 4: To learn metrology of screw, gear and surface texture.

BTME603-18 AUTOMOBILE ENGINEERING

Course Outcome

CO1: Identify the different parts of the automobile.
CO 2: Demostrate the working of various parts like engine, transmission, clutch, brakes, steering and the suspension systems.
CO 3: Explain the need of vehicle safety systems and future developments in the automobile industry.

Paper BTME 604-18 Introduction to Industrial Management

Course Outcome

CO1: 1.Understand the complexities associated with management in the organizations and integrate the learning in handling these complexities.
CO 2: 2.Demonstrate the roles, skills and functions of management.
CO 3: 3.Understand the concepts related to industrial management.

BTME605-18 REFREGERATION AND AIR CONDITIONING LAB

Course Outcome

CO1: Understand the fundamental principles and applications of refrigeration and air conditioning system
CO2: The students will be able to obtain cooling capacity and coefficient of performance by conducting test on refrigeration systems
CO3: The students will develop ability to calculate the energy requirements of cooling and heat equipment for air conditioning applications.
CO4: The students will be able to Explain the properties, applications and enironmental issues of different refrigerants.
CO5: The students can demonstrate an ability to analysis psychrometric processes and cycles of air conditioning systems.

Paper BTME606-18 Mechanical Measurements & Metrology Lab

Course Outcome

CO1: Demonstrate the use of instruments for measuring linear (internal and external), angular dimensions and surface roughness.
CO 2: Identify proper measuring instrument and know requirement of calibration, errors in measurement etc.

CO 3: Apply analytical and experimental methods to make measurements and to find and correct defects in measurement systems.

BTME603-18 AUTOMOBILE ENGINEERING LAB

Course Outcome

CO1: Identify the different parts of the automobile.

CO 2: Demostrate the working of various parts like engine, transmission, clutch, brakes, steering and the suspension systems.

CO 3: Explain the need of vehicle safety systems and future developments in the automobile industry.

BTME–608-18 : Minor Project

Course Outcome

CO1:Identify an open ended problem in area of mechanical engineering which requires further investigation.

CO2: Identify the methods and materials required for the project work.

CO3: Manage the work with team members.

CO4: . Formulate and implement innovative ideas for social and environmental benefits.

CO5: Write technical report of the project apart from developing a presentation.

Paper: Internal Combustion Engines 609-18

Course Outcome

CO1:Knowledge about the basics of IC engines

CO2:Ability to evaluate operational characteristics of IC Engines

CO3:Ability to ascertain the effects of fuel/supply systems on emission from an engine.

CO4:Ability to test engine performance

BTME-610-18 Mechatronics Systems

Course Outcome

CO1: Design mux, demux, flip-flops, and shift registers.

CO2:Describe the block diagram, registers, ALU, bus systems, timing & control signals, instruction cycles, and interrupts of 8085 microprocessors.

CO3: Apply the concept of 8085 microprocessor instruction sets and addressing modes in writing assembly language program for a given problem.

CO4: Describe the interfacing of memory, 8255 PPI, ADC, DAC, 7-segment LED system, stepper motor, 8251 and 8253 ICs with 8085 microprocessor

BTME-611-18 Microprocessor in automation

Course Outcome

Student is able to describe the architecture and different modes of operations of a typical microprocessor.

Student is able to understand different addressing modes and instructions of 8086 design and develop assembly language programs using software interrupts, subroutines, macros

Student is able to interface memory, I/O devises and interrupt controller with 8086 microprocessors.

Student is able to describe the internal architecture and different modes of operations of a typical microcontroller

Student is able to design and develop assembly language programs using 8051 microcontroller

CS 305.6 Student is able to analyze and compare the features of microprocessors and microcontrollers.

BTME612-18 COMPOSITE MATERIALS

Course Outcome

CO1: Explain the concept, need and applications of composite materials.

CO 2: Suggest/select optimum combination of Matrix/Reinforcement for various engineering applications.

CO 3: Analyze the effects of influencing factors on the strength of composite materials.

BTME-613-18 Computer Aided Design

Course Outcome

CO1: Create the different wireframe primitives using parametric representations

CO2: Create surface primitives using parametric modeling.

CO3: Create the different solid primitives using the different representation schemes

CO4: Apply geometric transformations on the created wireframe, surface and solid models.

Paper BTME 614-18 Product Design & Development

Course Outcome
CO1: Understand desirable design aspects considering various production processes and also understand the economic factors of design.
CO 2: Employ engineering, scientific, and mathematical principles to execute a design from concept to finished product.
CO 3: Apply the modern approaches to product design considering concurrent design, quality function deployment and various rapid prototyping methods.
CO 4: Apply innovative process techniques in synthesizing information, problem-solving and critical thinking.
BTME 615-18 : Non Conventional Energy Resources
Course Outcome
CO1: To Explain renewable energy sources & systems.
CO2: To Apply engineering techniques to build solar, wind, tidal, geothermal, biofuel, fuel cell, Hydrogen and sterling engine
CO3: To Analyze and evaluate the implication of renewable energy. Concepts in solving numerical problems pertaining to solar radiation geometry and wind energy systems.
CO4: To Demonstrate self -learning capability to design & establish renewable energy systems.
CO5: To Conduct experiments to assess the performance of solar PV, solar thermal and biodiesel systems
BTME616-18 : OPERATION RESEARCH
Course Outcome
CO1: Explain various mathematical deterministic operation research models.
CO2: Describe the problems of probabilistic and simulation models.
CO3: Demonstrate the queuing, inventory and replacement models etc.
CO4: Formulate and analyze the network models.
BTME617-18: MAINTENANCE & RELIABILITY
Course Outcome
CO1: Understand the concepts of reliability and maintainability
CO2: The students will be able to use statistical tools to characterise the reliability of an item and determine the reliability of a system, and will also understand the application of maintenance strategies in a manufacturing environment
CO3: The students will develop ability in formulating suitable maintenance strategies to enhance system reliability of a manufacturing system
Paper BTME701-18 Mechanical Vibrations
Course Outcome
CO1: Formulate mathematical models of problems in vibrations using Newton's second law or energy
CO 2: Understand the need and measurement of vibration in mechanical systems.
CO 3: Calculate principal modes of vibration.
CO4: Explore the suitable methods of vibration reduction and absorption.
CO5: Ability to determine vibratory responses of SDOF and MDOF systems.
CO6: Ability to determine vibratory responses of SDOF and MDOF systems.
Paper BTME702-18 Automation in manufacturing
Course Outcome
Illustrate the basic concepts of automation in machine tools.
Analyze various automated flow lines, Explain assembly systems and line balancing methods.
Describe the importance of automated material handling and storage systems.
Interpret the importance of adaptive control systems, automated inspection systems.
BTME703-18 Fundamentals of Management for Engineers
Course Outcome
CO1: The students understand the significance of Management in their Profession
CO2: The various Management Functions like Planning, Organizing, Staffing, Leading, aspects are learnt in this course
CO3: Understand the complexities associated with management in the organizations and integrate the learning in handling these complexities.
CO4: Demonstrate the roles, skills and functions of management.
BTME-704-18 : Project-II
Course Outcome

CO1: To create an Industrial environment and culture within the institution.
CO2: To set up production lab utilizing the infrastructure of the institution.
CO3: To standardize laboratories to industrial standard, thereby giving exposure to industrial housekeeping standards.
CO4: Demonstrate an ability to present and defend their research work to a panel of experts.
CO5: Demonstrate knowledge of contemporary issues in their chosen field of research.
BTME-801 Software/Industrial Training
Course Outcome
Capability to acquire and apply fundamental principles of engineering.
Become master in one's specialized technology
Become updated with all the latest changes in technological world.
Ability to communicate efficiently.
Knack to be a multi-skilled engineer with good technical knowledge, management, leadership and entrepreneurship skills.
Ability to identify, formulate and model problems and find engineering solution based on a systems approach.
Capability and enthusiasm for self-improvement through continuous professional development and life-long learning
Awareness of the social, cultural, global and environmental responsibility as an engineer

Name of Department: Mechanical Department
Paper: Advanced Engineering Materials MTME-101-18
Course Outcome
CO1: Identify and describe different types of material processing techniques for advanced materials
CO2: Ability to select suitable material for specific applications
Finite Element Method
Course Outcome
CO1: Explain the principles of vibrations;
CO2: Define and describe the concepts of vibration modes and natural frequencies and their measurement and estimation for multi-degree-of-freedom systems;
CO3: Explain System Modelling via use of Energy Analysis and its application to complex vibrating systems;
CO4: solve linear 2D structural beams and frames problems; 1Dheat conduction and convection heat transfer problems.
CO5:Recognise the use of different numerical techniques and its application to vibration design;
MTME-103 :Advanced Design of Mechanical Systems
Course Outcome
CO1: Learn integrating CAE, CAD, CAM tools.
CO2: Learn about proper material selection and know about influence of materials on form design of welded members, forgings and castings.
CO3: Understand general design principles for manufacturability.
CO4: Design to minimize material usage, design for recyclability & energy efficiency and design to regulations and standards.
MTME-104 : Operations Management
Course Outcome
CO1: Understand the concepts of operations management and various types of manufacturing systems & plant layouts with their characteristics, merits and demerits.
CO2: Learn about different types of planning and concepts of MACRO & MICRO process design.
CO3: Know about the concepts of demand forecasting, various demand patterns and qualitative and quantitative techniques of demand forecasting.
CO4: Understand the concept of aggregate production planning, different scheduling criteria and mutli-stage manufacturing systems.
CO5: Learn about various types of material flow and concepts of MRP, MRP-II, JIT and ERP along with their characteristics.
MTME-105 ADVANCED THERMODYNAMICS
Course Outcome
CO1: Describe the various laws of thermodynamics and their applications.
CO 2: Explain the concepts of availability and irreversibility with respect to reacting and nonreacting systems.
CO 3: Describe methods in using equations of potentials, availability, and exergy for thermodynamic analysis.
CO 4: Analyse the direct energy conversion methods and their applications.
MTME 201 RESEARCH METHODOLOGY
Course Outcome
CO1: Formulate a research problem
CO 2: Explain the different experimental designs and their analysis.
CO 3: Apply different statistical tools for the research analysis
CO 4: Apply the research ethics
MTME-202 Tribology

Course Outcome
CO1: The student will be able to study research papers for understanding of a new field and summarise them.
CO2: Ability to identify promising new directions of various cutting edge technologies.
CO3:The student will be able to effectively communicate by making an oral presentation.
MTME-203: Modern Manufacturing Processes
Course Outcome
CO1: Understand the importance and applications of advanced manufacturing processes
CO 2: Understand the working principle and theory of material removal of various advanced machining processes
CO 3: Determine the material removal rate and surface finish achieved by various advanced machining processes
CO 4: Understand the different techniques to form the miniature product from metal powder
CO 5: Learn about Additive manufacturing such as 3-D printing
Paper MTME204 Computational Fluid Dynamics
Course Outcome
CO1: Provide the student with a significant level of experience in the use of modern CFD software for the analysis of complex fluid-flow systems.
CO 2: Improve the student's understanding of the basic principles of fluid mechanics.
CO 3: Improve the student's research and communication skills using a self-directed, detailed study of a complex fluid-flow problem and to communicate the results in written form.
MTME –205: Advanced Welding Technology
Course Outcome
CO1: Learn about the classification of various welding processes, welding defects and their
CO 2: Understand the terms weldability, soldering, brazing, welding symbols and safety and
CO 3: Understand the concept of various terms of welding arc such as arc efficiency, arc forces,
CO 4: Learn about the various types of welding electrodes, welding fluxes, shielding gases, AC and
CO 5: Learn about various advanced welding processes along with their advantages, limitations and
Advanced Material Characterization MTME-207-18
Course Outcome
CO:1 apply appropriate characterization techniques for microstructure examination at different magnification level and use them to understand the microstructure of various materials
CO:2 choose and appropriate electron microscopy techniques to investigate microstructure of materials at high resolution
CO:3 determine crystal structure of specimen and estimate its crystallite size and stress
CO:4 apply thermal analysis techniques to determine thermal stability of and thermodynamic transitions of the specimen
Rapid Prototyping MTME-208
Course Outcome
CO:1 Generating a good understanding of RP history, its development and applications. Expose the students to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering
CO:2 Students will be exposed to different types of Rapid prototyping processes, materials used in RP systems and reverse engineering.
MTME 209: Advanced metal cutting

Course Outcome
CO1: Overview of the principles of metal cutting
CO 2: Describe the methods of metal cutting
CO 3: Describe the cutting forces involved and their measurements
CO 4: Describe the parameters effecting tool forces
CO 5: Describe the theory/methods to find tool life.
Paper MTME 210 Advanced Casting Processes
Course Outcome
CO1: Analyze and access the use of casting processes in manufacturing .
CO 2: Understand the working of various casting processes.
CO 3: To inculcate the principle, thermal and metallurgical aspects during solidification of metals & alloys.
CO 4: To impart knowledge about the principles/methods of casting with detailed design of gating/riser system needed for casting.
CO 5: To impart knowledge about defects in casting objects and requirements for achieving sound casting.
MTME–211 :Maintenance and Reliability Engineering
Course Outcome
CO1: Understand the concepts of Maintenance, Reliability and Availability.
CO2: Establish maintenance strategies according to system characteristics and design transition programs to implement these strategies.
CO3: Develop fault trees for a system and apply various reliability models on fault analysis.
CO4: Develop hazard rate models to know the behaviour of components.
CO5: Manage the manufacturing organisation with highest possible availability.
MTME–212 : Supply Chain Management
Course Outcome
CO1: Understand the supply chain performance and supply chain drivers
CO2: Apply the concept of managing economies of scale in a supply chain and importance of transportation in a supply chain.
CO3: Learn about the logistics and competitive strategy and measuring logistics costs for its performance.
CO4: Apply the concepts of benchmarking in supply chain and coordination in a supply Chain.
CO5: Identify the malfunctions in rotating machinery using vibration measurements.
MTME-214: Engineering Design Optimization
Course Outcome
CO1: Describe different methods of optimization
CO 2: Model and formulate optimization problems in standard form and assess the optimality of a solution.
CO 3: Determine the optimal solution for unconstrained and constrained problems of multiple variables.
CO 4: Analyse the sensitivity of a solution to different variables.
CO 5: Determine the advantages and disadvantages of applying different optimization techniques for a specific problem.
MTME-217 : Dynamics of Rotating Machines
Course Outcome
CO1: Model the Rotor bearing systems and formulate the governing equations.
CO2: Compute the critical speeds and stability limits.

CO3: Compute the transient response of rotors.
CO4: Predict the response of a rotor bearing system through analytical models.
CO5: Identify the malfunctions in rotating machinery using vibration measurements.
MTME-219 : Sustainable Design and Manufacturing
Course Outcome
CO1: Understand the concepts of sustainability, sustainable development and linkages between technology and sustainability.
CO2: Understand the concept and different tools & techniques of sustainable manufacturing.
CO3: Learn about different environmental standards and their requirement for sustainable development.
CO4: Learn about various eco-friendly product design methods and multi-criteria decision making in sustainability.
CO5: Understand the environmental, economic, societal and business indicators of sustainability.
MTME-220 Vibration and Noise Control
Course Outcome
CO1: Understand the multi-degree freedom system and concept of free and forced vibrations
CO2: Understand the implementation of different numerical methods of multi-degree system.
CO3: Learn about the concepts regarding vibration of strings, bars, shafts and beams.
CO4: Understand the concept of vibration control and measurement, vibration isolation, vibration exciters and vibration absorbers.
CO5: Learn about fundamentals of noise measurement and noise control.
MTME-221 COMPOSITE MATERIALS
Course Outcome
CO1: Describe the concept, need and applications of composite materials.
CO 2: Solve the problem of effects of influencing factors on the strength of composite materials
CO3: Demostrate the various manufacturing processes of the composites
CO 4:Suggest/select optimum combination of Matrix/Reinforcement for various engineering applications.
Design of Steam Turbines MTME-224
Course Outcome
CO:1 Students will be able to practice the basic concepts and working cycles for steam engines.
CO:2 Student will be able to design the blades and impeller for impulse and reaction turbines.
CO:3 Student will be able to identify and make different types of condensers, cooling water calculations etc.
MTME-225 Convective Heat Transfer
Course Outcome
CO1: Development of 3D unsteady (generalized) momentum, energy and mass transfer equations in the Cartesian system, representing them in tensor and vector notations, expandable to other coordinate systems.
CO2: Development of generalized Integral form of Momentum and energy equations, identification of the displacement, momentum, conduction and enthalpy thicknesses, solutions for variable free stream velocities over curved surface and for flow over a body of arbitrary shape.
CO3: Analysis of momentum and energy boundary layers in pipe flows, identification of entrance and fully developed region during laminar flow, solution of energy differential equations for constant heat flux and

CO4: Modelling of external and ... heat convection, rules to modify the laminar momentum and energy equations and develop equations for the turbulent flows.
CO6: Analyze heat exchanger performance by using the method of heat exchanger effectiveness.
Combustion Engineering MTME-226
Course Outcome
CO: 1 Understand precisely a difference between premixed combustion and diffusion combustion.
CO:2 Learn combustion mechanisms of gaseous, liquid and solid fuels
CO: 3 Learn chemiluminescence phenomena of flame and the prevention method of air pollutant
MTME-227 Conductive & Radiative Heat Transfer
Course Outcome
CO1: Calculate emission of thermal radiation from a black body or grey body.
CO2: Calculation of view factor between two objects.
CO3: Analyse simple radiation interchange between diffuse surfaces, radiation from a volume to a surface and an object with radiation, convection and conduction.
CO4: Understand the fundamentals of convective heat transfer process.
CO5: Analyze heat exchanger performance by using the method of heat exchanger effectiveness.
MTME-229 Design of HVAC Systems
Course Outcome
CO1: Describe the requirement specifications for indoor air quality, energy supply and energy use.
CO2: Describe system solutions for renewable energy production and heat storage
CO3: Describe system solutions for ventilation and tempering of rooms
CO4: Describe solutions for domestic hot water supply, sewerage and preparation of domestic hot water methods
CO5: Describe the components of HVAC system.
CO6: Describe the content of solutions for monitoring and control of air conditioning plants
Design and optimization of Thermal Systems MTME-230
Course Outcome
CO:1 Integrate thermal component models and simulate a thermal system
CO:2 Perform an economic analysis of a thermal system.
CO:3 Use the computer to solve thermal system models
CO:4 Communicate thermal system designs both orally and in writing
CO:5 Apply optimization procedures and design optimized thermal systems
MTME–301 :Project
Course Outcome
CO1: Identify an engineering problem, devise a means of solving and exhibit the ability to execute the solution.
CO2:Demonstrate knowledge of professional and ethical responsibilities
CO3:Formulate and implement innovative ideas for social and environmental benefits.
CO4:Write technical report of the project apart from developing a presentation.
CO5: Demonstrate an ability to present and defend their research work to a panel of experts.
Paper MTME404 Dissertation
Course Outcome
CO1: Demonstrate a depth of knowledge of Mechanical Engineering.
CO 2: Complete an independent research project, resulting in at least a thesis publication, and research outputs in terms of publications in high impact factor journals, conference proceedings, and patents.
CO 3: Demonstrate knowledge of contemporary issues in their chosen field of research.

CO4: Demonstrate an ability to present and defend their research work to a panel of experts.

Research Methodology (Phd. Course Work)
Course Outcome
CO1: Formulate a research problem
CO 2: Explain the different experimental designs and their analysis.
CO 3: Apply different statistical tools for the research analysis
CO 4: Apply the research ethics
Non Conventional Machining (PhD Course Work)
Course Outcome
CO1: Understand the need of Non Conventional Machining Processes and able to Classify various processes.
CO2: Recognize the role of mechanical energy in non-Conventional machining processes.
CO3: Apply the knowledge on machining electrically conductive material through electrical energy in non-Conventional machining processes.
CO4: Understand the concept of machining the hard material using chemical energy andelectrochemical energy.
CO5: Apply the knowledge on machining electrically conductive material through electrical energy in non-Conventional machining processes.
CO6: Familiarity and application of various thermal energy based non-conventional machining processes.
PhD Paper Presentation/Seminar
Course Outcome
CO1: Deal with nerves and think more positively about public speaking.
CO 2: Consider ways of grabbing the listener's attention, holding their interest, and concluding strongly.
CO3: Use body language and tone of voice to enhance their presentations.
CO4: Use slides and visual aids effectively.
CO5: Deliver an enthusiastic and well-practised presentation.
Advanced Heat Transfer
Course Outcome
CO1: Understand the principles of heat transfer through conduction, convection and radiation modes.
CO2: Understand the heat transfer during phase-change processes, such as boiling and condensation.
CO3: Understand the practical aspects of the theories of heat transfer, such as design of heat exchangers.
CO4: Understand the concept related to mass transfer and its connection with heat transfer.
CO5: Carry out laboratory tests verifying the various principles of heat transfer.
Advanced Fluid Mechanics and CFD
Course Outcome
CO1: Understand the concept of computational fluid dynamics, modeling and simulation.
CO2: Learn about the different governing equations of fluid dynamics.
CO3: Understand the concept of parabolic, elliptic and hyperbolic equations and various methods of finite differencing and stability.
CO4: Understand the concept of turbulence, error and uncertainty & different turbulent
Finite Elements Methods

Course Outcome
CO1: To obtain an understanding of the fundamental theory of the FEA method;
CO2: To develop the knowledge of mathematics and engineering in solving the problems related to structural and heat transfer.
CO3: To identify the application and characteristics of FEA elements such as bars, beams, plane and isoparametric elements
CO4: To understand the application and use of the FE method for heat transfer problems
CO5: Use the commercial FEA packages like ANSYS and modern CAD/CAE tools for solving real life structural problems.
Composite Materials
Course Outcome
CO1: Describe the concept, need and applications of composite materials.
CO 2: Solve the problem of effects of influencing factors on the strength of composite materials
CO3: Demonstrate the various manufacturing processes of the Metal/ ceramic/polymer-based composites.
CO 4: Test and characterize the composite and suggest secondary processing as per application.
Optimization Techniques
Course Outcome
CO1: Ability to apply the theory of optimization methods and algorithms to develop and for solving various types of optimization problems
CO2: Ability to go in research by applying optimization techniques in problems of Engineering and Technology
CO3: Ability to solve the mathematical results and numerical techniques of optimization theory to concrete Engineering problems by using computer software.
Computer Aided Design and Manufacturing (CAD/CAM)
Course Outcome
CO1: Apply/develop solutions or to do research in the areas of Design and simulation in Mechanical Engineering.
CO2: Have abilities and capabilities in developing and applying computer software and hardware to mechanical design and manufacturing fields.
CO3: Review and document the knowledge developed by scholarly predecessors and critically assess the relevant technological issues.
CO4: Formulate relevant research problems; conduct experimental and/or analytical study and analyzing results with modern mathematical/scientific methods and use of software tools.
Advanced Theory of Vibrations
Course Outcome
CO1: Recognize the need and measurement of vibration in mechanical systems
CO2: Suggest suitable methods of vibration reduction and absorption
CO3: Calculate natural frequencies of vibrations
CO4: Distinguish between systems with different degrees of vibration
Tribology
Course Outcome
CO1: Be able to know the field of tribology.
CO2: Be able to know the surface, properties of surface and related instruments
CO3: Be able to understand the friction, friction theory and behaviour of metals and non-metals

CO4: Be able to understand wear processes, wear theory, behaviour of metals and non-metals and different instruments
Thermo Economics and Power Plants
Course Outcome
CO1: Understand and know the requirements for a Thermal Power Plant and Nuclear Power Plant, from sources to consumption and economics of power plants
CO2: Study and learn the processes and cycles followed in Thermal Power Plants and nuclear power plants and components used in the power plants.
CO3: Apply the knowledge gained by analyzing the steam power plants, steam generators and gas turbine power plants, to improve the efficiency and reduce the thermal losses.
CO4: Apply the knowledge in calculating the Power Load Calculations and Distribution.
Advanced Thermodynamics
Course Outcome
CO1: Describe the various laws of thermodynamics and their applications
CO 2: Explain the concepts of availability and irreversibility with respect to reacting and nonreacting systems.
CO 3: Describe methods in using equations of potentials, availability, and exergy for thermodynamic analysis.
CO 4: Explain the behaviour of gases and chemical equilibrium.
Presentation/Seminar
Course Outcome
CO1: Deal with nerves and think more positively about public speaking.
CO 2: Consider ways of grabbing the listener's attention, holding their interest, and concluding strongly.
CO3: Use body language and tone of voice to enhance their presentations.
CO4: Use slides and visual aids effectively.
Production Engineering
Course Outcome
CO1: Understand the various Conventional and Non-Conventional machining processes
CO2: Learn about measuring equipment, error types and their evaluation
CO3: Learn about process capability and six sigma
CO4: Learn about quality control and quality assurance systems
Advanced Mechanics of Solids
Course Outcome
CO1: Understand concepts of stress and strain in solids and associated theories of failure.
CO2: Derive governing equations to solve engineering problem.
CO3: Apply analysis techniques to determine stress in components such as shafts, beams, shells and rotating discs under different loading conditions.
CO4: Analyze deformations in beam and locate shear centre in thin-walled beams.
Mechatronics
Course Outcome
CO1: Each individual should develop competence in technologies of automation.
CO2: Capable to develop simple control systems and study the system response.
CO3: Individual should be able to understand the communication system in automation

CO4: Analyze deformations in beam and locate shear centre in thin-walled beams.
Product Design and Development
Course Outcome
CO1: To introduce the objects of product design and requirements of a good product design.
CO2: Knowledge of different design principles like designing for function, production, installation and handling, maintenance, packing etc.
CO3: Knowledge and use of latest CAD/CAM/CAE software for different design and development functions.