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 Meas 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 Qui Assignments,End Term Exa
CO 2: To be able to understand the concept of wave packets using Heisenberg's uncertainty principle.			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
CO 3: To be able to apply Schrodinger's wave equations to study the complex physical phenomenon.			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
CO 4: To be able to understand the structure of crystalline solids by applying knowledge of crystallography.			√		√		√	√		√		√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
CO 5: To be able to understand semiconducting materials by using the concepts of band theory of solids.	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa

BTAMXX-18 - Maths-1

Department of Mechanical Engineering
LK. Guru Pt... Bus University
(Main Ca... Kurukshetra

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 Meas Attainment of CO
CO1:Students will be able to remember terminologies and formulae in matrices, complex	√		√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qui Assignments,End Term Exa
CO2: Students will be able to understand and interpret the concepts of matrices, complex			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qui Assignments,End Term Exa
CO3:Students will be able to compare and analyze the methods in matrices, complex numbers	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa

BTEE101-18 Basic Electrical Engineering

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

Head
Department of Mechanical Engineering
I.K. Gujral Punjab Technical University
(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 Employabilit y / Entrepreneu rship	Assessment Tools to Meas 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 Qu Assignments,End Term Exa
CO 2: Be able to analyze of DC circuits, AC Circuits		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
CO 3: Understand the basic magnetic circuits and apply it to the working of electrical machines		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa

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

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 Employabilit y / Entrepreneu rshin**	**Assessment Tools to Meas Attainment of CO**
CO1: The ability to use common electrical measuring instruments and understand the fundamentals of electrical engineering	√	√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qui Assignments,End Term Exa
CO 2: The ability to make electrical connections, and measure power, power factor using appropriate equipments.		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qui Assignments,End Term Exa
CO 3: Have the knowledge of electrical machines, components and their ratings		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qui Assignments,End Term Exa
CO 4: Understand the operation of transformers and electrical machines		√	√		√		√	√		√		√	Understanding	Yes	Minor Exams, Buisness Qui Assignments,End Term Exa

Paper BTME101-18 Engineering Graphics & Design

Department of Mechanical Engineering I.K.G. Punjab Technical University 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 rshin**	**Assessment Tools to Meas 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, Assignment Term Exams
CO 2: to prepare to communicate effectively.	√	√	√	√	√	√	√	√	√	√	√	√	Communicate	Yes	Minor Exams, Quiz, Assignment Term Exams
CO 3: to prepare to use the techniques, skills, and modern engineering tools necessary for engineering practice.	√	√	√	√	√	√	√	√	√	√	√	√	Apply	Yes	Minor Exams, Quiz, Assignment Term Exams

BMPD101-18 Mentoring and professional 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**	**PO1 0**	**PO1 1**	**PO1 2**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Meas Attainment of CO**
CO1: The student will be able to effectively communicate and present technical material.	√	√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
CO2: Ability to think critically and creatively to generate innovative and optimum solutions.		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
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 Qu Assignments,End Term Exa
CO4: Engage in continuous education, training and research, and take control of their own learning and overall development.		√	√		√		√	√			√		Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa

Head
Department of Mechanical Engineering
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(Main Campus) Kapurthala

BTCH101-18 - Chemistry -1

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 Mea Attainment of CO
Analyse microscopic chemistry in terms of atomic and molecular orbitals and intermolecular forces.	√		√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
Rationalise bulk properties and processes using thermodynamic considerations.			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
Distinguish the ranges of the electromagnetic spectrum used for exciting different molecular energy levels in various spectroscopic techniques.			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
Rationalise periodic properties such as ionization potential, electronegativity, oxidation states and electronegativity.			√		√		√	√		√		√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
List major chemical reactions that are used in the synthesis of molecules.	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa

BTCH102-18 - Chemistry Lab

Department of Mechanical Engineering
I.K.G. PTU Campus
Kapurthala

Department of Mechanical Engineering
I.K. Gujral Punjab Technical University
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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 Mea Attainment of CO

Estimate rate constants of reactions from concentration of reactants/products as a function of time	√		√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
Measure molecular/system properties such as surface tension, viscosity, conductance of solutions, redox potentials, chloride content of water, etc			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
Synthesize a small drug molecule and analyse a salt sample			√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa

BTAMXX-18 Mathematics II

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 Employabilit y / Entrepreneu rshin**	**Assessment Tools to Mea Attainment of CO**
CO1: The mathematical tools needed in evaluating multiple integrals and their usages.	√		√	√	√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
CO 2: The effective mathematical tools for the solutions of differential equations that model physical processes.			√	√	√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
CO 3: The tools of differentiation and integration of functions that are used in various techniques dealing engineering problems.			√	√	√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa

Department of Mechanical Engineering
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BTPS101-18 Programming for Problem Solving

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 Mea Attainment of CO
To formulate simple algorithms for arithmetic and logical problems.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
To translate the algorithms to programs (in C language).		√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
To test and execute the programs and correct syntax and logical errors.		√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
To implement conditional branching, iteration and recursion.		√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
To decompose a problem into functions and synthesize a complete program using divide and conquer approach.		√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
To use arrays, pointers and structures to formulate algorithms and programs.		√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Qui Assignments,End Term Exa
To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.		√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Qui Assignments,End Term Exa
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 Qui Assignments,End Term Exa

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BTPS102-18 Programming for Problem Solving Lab

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 Mea Attainment of CO
To formulate the algorithms for simple problems	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
To translate given algorithms to a working and correct program	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
To be able to correct syntax errors as reported by the compilers	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
To be able to identify and correct logical errors encountered at run time	√	√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
To be able to write iterative as well as recursive programs	√	√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
To be able to represent data in arrays, strings and structures and manipulate them through a program	√	√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
To be able to declare pointers of different types and use them in defining self referential structures.	√	√	√		√	√		√		√		√	Understanding	Yes	Minor Exams, Buisness Qui Assignments,End Term Exa

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

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 / Entrepreneurshin**	**Assessment Tools to Meas 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 lea Assignments,End Term Exa
CO 2: able to fabricate components with their own hands.	√	√	√	√	√	√	√			√	√	√	Apply	Yes	Minor Exams, Project based lea Assignments,End Term Exa
CO 3: Get practical knowledge of the dimensional accuracies and dimensional tolerances possible with different manufacturing processes	√	√	√	√	√	√	√			√	√	√	Understanding	Yes	Minor Exams, Project based lea Assignments,End Term Exa
CO 4: By assembling different components, they will be able to produce small devices of their interest.	√	√	√	√	√	√	√			√		√	Apply	Yes	Minor Exams, Project based lea Assignments,End Term Exa

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 / Entrepreneurshin**	**Assessment Tools to Meas 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 lea Assignments,End Term Exa
Students will acquire basic proficiency in reading & listening, comprehension, writing and speaking skills.	√	√	√	√	√	√	√			√	√	√	Apply	Yes	Minor Exams, Project based lea Assignments,End Term Exa
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 lea Assignments,End Term Exa
They will be able to converse fluently.	√	√	√	√	√	√	√			√		√	Apply	Yes	Minor Exams, Project based lea Assignments,End Term Exa

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**	**PO10**	**PO11**	**PO12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Mea 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 le Assignments,End Term Exa
Students will acquire basic proficiency in listening and speaking skills.	√	√	√	√	√	√	√			√	√	√	Apply	Yes	Minor Exams, Project based le Assignments,End Term Exa
Students will be able to understand spoken English language, particularly the language of their chosen technical field.	√	√	√	√	√	√	√			√	√	√	Understanding	Yes	Minor Exams, Project based le Assignments,End Term Exa

Department of Engineering
I.K. Gujral Punjab Technical University
(Main Campus) Kapurthala

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

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 rshin	Assessment Tools to Mea Attainment of CO
CO1: The student will be able to effectively communicate and present technical material.	√	√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
CO2: Ability to think critically and creatively to generate innovative and optimum solutions.		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
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 Qu Assignments,End Term Exa
CO4: Engage in continuous education, training and research, and take control of their own learning and overall development.		√	√		√		√	√		√		√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa

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 rshin	Assessment Tools to Mea Attainment of CO

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

BTME302-18 Theory of Machines -1

HOD
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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 Mea Attainment of CO**
CO1: Understand constructional and working features of important machine elements.	√	√	√	√	√	√			√		√	√	Understanding	Yes	Minor Exams, Assignments, En Exams
CO2: Design belt, rope and chain drives for transmission of motion from one shaft to	√	√	√	√	√	√			√		√	√	Understanding	Yes	Minor Exams, Assignments, En Exams
CO3: Identify different Cam and follower pairs for different applications and construct cam	√	√	√	√	√	√			√		√	√	Understanding	Yes	Minor Exams, Assignments, En Exams

Department of Mechanical Engineering
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CO4: Understand the function of brakes, dynamometers, flywheel and governors.	√	√	√	√	√	√			√		√	√	Understanding, Applying	Yes	Minor Exams, Assignments, En 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 Mea Attainment of CO
CO1: Read, draw and interpret the machine drawings and related parameters.	√	√	√							√	√	√	Understanding	Yes	Minor Exams, Class and Ho Assignments, End Term Exa
CO2: Use standards used in machine drawings of machine components and assemblies.	√	√	√							√	√		Applying	Yes	Minor Exams, Class and Ho Assignments, End Term Exa
CO3: Learn the concept of limits, fits and tolerances in various mating parts.	√	√	√							√	√		Understanding	Yes	Minor Exams, Class and Ho Assignments, End Term Exa
CO4: Visualize and generate different views of a component in the assembly.	√	√	√		√					√	√	√	Applying	Yes	Minor Exams, Class and Ho Assignments, End Term Exa
CO5: Use CAD tools for making drawings of machine components and assemblies.	√	√	√		√					√	√	√	Applying	Yes	Minor Exams, Class and Ho Assignments, End Term Exa

BTME304-18 STRENGTH OF MATERIALS-I

HOD
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Kapurthala

Dean
Department of Mechanical Engineering
I.K. Gujral Punjab Technical University
(Main Campus) 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 Meas 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 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 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 Exams
CO 4: Calculate load carrying capacity of columns and struts and their buckling strength.	√	√	√		√	√			√	√	√	√	Analysing	Yes	Minor Exams, Assignments, End Exams
CO 5: Evaluate the slope and deflection of beams subjected to loads.	√	√	√		√	√			√	√	√	√	Analysing	Yes	Minor Exams, Assignments, End Exams

BTME305-18 Basic Electronics Engineering

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

Head Department of Mechanical Engineering I.K. Gujral Punjab Technical University (Main Campus) 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 Mea Attainment of CO
Understand construction of diodes and their rectifier applications.	√	√	√			√			√	√	√	√	Understanding	Yes	Minor Exams, Assignments, En Exams

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

Paper Basic Thermodynamics BTME 305-18

Course Outcome	**PO 1**	**PO 2**	**PO 3**	**PO 4**	**PO 5**	**PO6**	**PO7**	**PO8**	**PO9**	**PO10**	**PO11**	**PO12**	**Skill**	**Focus on Employability / Entrepreneurship**	**Assessment Tools to Mea Attainment of CO**
CO1: Apply energy balance to Systems and Control Volumes in situations involving heat and work interactions.	√	√	√		√		√	√	√	√	√		Applying	Yes	Minor Exams, Quiz, demonstr through videos/ lab, End Term
CO2: Evaluate changes in thermodynamic properties of substances		√	√	√	√				√		√	√	Applying	Yes	Minor Exams, Quiz, demonstr through videos/ lab, End Term
CO3:Evaluate performance of energy conversion devices		√	√	√	√				√		√	√	Applying	Yes	Minor Exams, Quiz, demonst through videos/ lab, End Term
CO4:Explain and apply various gas power and vapor power cycles		√	√	√	√	√			√	√	√		Understanding	Yes	Minor Exams, Quiz, demonst through videos/ lab, End Tern

BTME306-18 Strength of Material Lab

Department of Mechanical Engineering
I.K. Gujral Punjab Technical University
(Main Campus) Kapurthala

Department of Mechanical Engineering
P.T.U. Main Campus
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 Mea 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 Mea Attainment of CO
CO1: Understand constructional and working features of important machine elements.	√	√	√	√	√	√			√		√	√	Understanding	Yes	Minor Exams, Assignments, En Exams
CO2: Design belt, rope and chain drives for transmission of motion from one shaft to															
another	√	√	√	√	√	√			√		√	√	Designing	Yes	Minor Exams, Assignments, En 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, En Exams
CO4: Understand the function of brakes, dynamometers, flywheel and governors.	√	√	√	√	√	√			√		√	√	Understanding, Applying	Yes	Minor Exams, Assignments, En Exams
Paper BTME308-18 Fluid Mechanics 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 Mea 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 Qu Assignments,End Term Exa
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 Qu Assignments,End Term Exa
BMPD301-18 Mentoring and professional Development															

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Kapurthala (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 Mea Attainment of CO
CO1: The student will be able to effectively communicate and present technical material.	√	√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
CO2: Ability to think critically and creatively to generate innovative and optimum solutions.		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
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 Qu Assignments,End Term Exa
CO4: Engage in continuous education, training and research, and take control of their own learning and overall development.		√	√		√		√	√		√		√	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa

BTME401-18 APPLIED THERMODYNAMICS

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

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 Mea Attainment of CO
CO1: Explain the functioning and performance evaluation of reciprocating air compressors.	√		√	√	√	√	√		√	√		√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, En Exams
CO 2: Analyze the combustion phenomenon in boilers and I.C. engines.	√	√		√	√	√	√	√	√	√			Understanding, Applying	Yes	Minor Exams, Assignments, En Exams

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CO 3: Use of Steam Tables and MollierChart to solve vapour power cycle problems.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, Er Exams
CO 4: Demostrate the constructional features and working of steam power plants and to evaluate their performance.	√	√	√	√	√	√	√		√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, Er 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 Employabilit y / Entrepreneu rship**	**Assessment Tools to Mea 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, Assignm Powerpoint Presentations, Nur 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, Assignm Powerpoint Presentations, Nur etc.
CO 3: Know about constructional details, working and evaluate the performance of centrifugal pump under different vane shape conditions.	√	√	√			√	√		√	√		√	Knowledge	Yes	Lectures, Tutorials, Assignm Powerpoint Presentations, Nur 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, Assignm Powerpoint Presentations, Nur 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 Meas 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, En 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, En 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, En Exams
CO 4: Calculate load carrying capacity of columns and struts and their buckling strength.	√	√	√		√	√			√	√	√	√	Analysing	Yes	Minor Exams, Assignments, En Exams
CO 5: Evaluate the slope and deflection of beams subjected to loads.	√	√	√		√	√			√	√	√	√	Analysing	Yes	Minor Exams, Assignments, En 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 Mea Attainment of CO

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CO1: Illustrate the significance of structure-property-correlation for engineering materials including ferrous and nonferrous.	√	√		√	√	√	√		√	√	√	√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, En 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, En Exams
CO 3: Identify the various structural changes occurred in metals with respect to time temperature transformations.	√	√	√	√	√	√	√		√	√	√	√	Understanding, Applying	Yes	Minor Exams, Assignments, En 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, En Exams

BTME405-18 : Theory of Machines -II

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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 Mea 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, En Exams
CO2: Understand balancing of rotating and reciprocating parts of machines.	√	√	√	√	√						√	√	Understanding & Applying	Yes	Minor Exams, Assignments, En 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, En Exams

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

BTME406-18 APPLIED THERMODYNAMICS Lab

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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 / Entrepreneurshin	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

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 / Entrepreneurshin	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

Department of Mechanical Engineering
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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

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
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

Department of Mechanical Engineering
G PTU, 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 / Entrepreneurshin	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

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I.K.G. P.T.U. Main Campus
Kapurthala

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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 / Entrepreneurshin	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

Department of Mechanical Engineering
K.G. P.T.U.
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 / Entrepreneurshin	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	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurshin	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

Department of Mechanical Engineering
M.K.G.V.P.T.U.
Kapurthala

Department of Mechanical Engineering
I.K. Gujral Punjab Technical University
(Main Campus) Kapurthala

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

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

Paper BTMC102-18 ESSENCE OF INDIAN KNOWLEDGE TRADITION

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

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**
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

ecome updated with all the latest hanges in technological world.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
bility to communicate efficiently.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
nack to be a multi-skilled engineer ith good technical knowledge, anagement, leadership and ntrepreneurship skills.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
bility to identify, formulate and odel problems and find ngineering solution based on a stems approach.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
apability and enthusiasm for self-nprovement through continuous rofessional development and life-ng learning	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
wareness of the social, cultural, obal and environmental sponsibility as an engineer.	√	√	√	√	√	√	√			√	√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams

TME601-18 REFREGERATION AND AIR CONDITIONING

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

Head
Department of Mechanical Engineering
I.K. Gujral Punjab Technical University
(Main Campus) Kapurthala

ourse 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**	**Employability / Entrepreneurship**	**Assessment Tools to Measu Attainment of CO**
O1: Understand the fundamental rinciples and applications of efrigeration and air conditioning ystem	√	√	√	√	√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End T 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

Head
Department of Mechanical Engineering
I.K. Gujral Punjab Technical University
(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 / Entrepreneurshin	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 (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: 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

Department of Mechanical Engineering
I.K. Gujral Punjab Technical University
(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
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

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

Head Department of Mechanical Engineering I.K. Gujral Punjab Technical University (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: 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 rshin	Assessment Tools to Measu Attainment of CO
CO1: Demonstrate the use of nstruments for measuring linear internal and external), angular dimensions and surface roughness.	√	√	√	√	√	√			√	√	√	√	Understanding	Yes	Case Study, Group Discussions,
CO 2: Identify proper measuring nstrument 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 ystems.	√	√	√	√	√	√			√	√	√	√	Applying	Yes	Case Study, Group Discussions,

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(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 rshin	Assessment Tools to Measu Attainment of CO
CO1: Identify the different parts of he automobile.	√		√	√	√	√	√		√	√	√	√	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End T Exams
CO 2: Demostrate the working of arious parts like engine, ransmission, clutch, brakes, teering and the suspension ystems.	√		√	√	√	√	√	√	√	√	√	√	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 anc Viva
CO2: Identify the methods and materials required for the project work.	√	√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations anc Viva
CO3: Manage the work with team members.	√		√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations anc Viva
CO4: . Formulate and implement innovative ideas for social and environmental benefits.	√	√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations anc Viva
CO5: Write technical report of the project apart from developing a presentation.	√	√	√	√	√	√	√		√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations anc Viva

Paper: Internal Combustion Engines 609-18

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

Department ... Engineering
I.K. Gujral ... University
(Main Campus) Kapurthala

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO10	PO11	PO12	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

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

Department of Mechanical Engineering
I.K. Gujral Punjab Technical University
(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

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
Student is able to describe the architecture and different modes of operations of a typical microprocessor.		√	√	√	√		√	√	√	√	√		Applying and Designing	Yes	Minor Exams, Assignments, End T 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 T Exams
Student is able to interface memory, I/O devises and interrupt controller with 8086 microprocessors.	√	√	√		√	√	√	√	√	√	√		Applying and Designing	Yes	Minor Exams, Assignments, End T 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 T Exams
Student is able to design and develop assembly language programs using 8051 microcontroller	√		√	√	√		√			√		√	Applying and Designing	Yes	Minor Exams, Assignments, End T 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 Exams

BTME612-18 COMPOSITE MATERIALS

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 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

Department of Mechanical Engineering
I.K.G. PTU, Main Campus
Kapurthala

Department of Mechanical Engineering
I.K. Gujral Punjab Technical University
(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: 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

Department of Mechanical Engineering
I.K. Gujral Punjab Technical University
(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: 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 / Entrepreneurshin	Assessment Tools to Measu Attainment of CO
CO1: To Explain renewable energy ources & systems.	√	√				√						√	Understanding	Yes	Minor Exams, Buisness Quiz, End Exams
CO2: To Apply engineering echniques to build solar, wind, dal, geothermal, biofuel, fuel cell, ydrogen and sterling engine	√	√	√	√	√	√	√	√	√		√		Designing	Yes	Minor Exams, Buisness Quiz, End Exams
CO3: To Analyze and evaluate the mplication of renewable energy. oncepts in solving numerical roblems pertaining to solar adiation geometry and wind	√	√	√	√	√	√	√				√		Applying	Yes	Minor Exams, Buisness Quiz, End Exams
O4: To Demonstrate self -learning apability to design & establish enewable energy systems.	√	√	√	√	√	√	√	√	√		√	√	Applying	Yes	Minor Exams, Buisness Quiz, End Exams
O5: To Conduct experiments to ssess the performance of solar PV, olar 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.
Kanthala

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 / Entrepreneurshin	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

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

Punjab Technical Univ

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	PO1 0	PO1 1	PO1 2	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, Assignment Powerpoint Presentations, Numer etc.
CO4: Explore the suitable methods of vibration reduction and absorption.	√	√	√	√	√	√	√		√	√	√	√	Applying	Yes	Lectures, Tutorials, Assignment Powerpoint Presentations, Numer etc.
CO5: Ability to determine vibratory responses of SDOF and MDOF systems.	√	√	√	√	√	√	√		√	√	√	√	Analyse	Yes	Lectures, Tutorials, Assignment Powerpoint Presentations, Numer etc.
CO6: Ability to determine vibratory responses of SDOF and MDOF systems.	√	√	√	√	√	√	√		√	√	√	√	Analyse	Yes	Lectures, Tutorials, Assignment Powerpoint Presentations, Numer etc.

Paper BTME702-18 Automation in manufacturing

HOD
Department of Mechanical Engineering
G. B.T.U. Main Campus
Mumbai

Principal
Engineering
Technical University
Lucknow

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
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

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

Head
Department of Mechanical Engineering
I.K. Gujral Punjab Technical University
(Main Campus)

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

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

Head
Department of Mechanical Engineering
I.K. Gujral Punjab Technical University
(Main Campus)

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: 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 undamental principles of ngineering.	√		√		√	√	√	√	√	√	√	√	Understanding	Yes	Reports, Project Presentations and Viva
ecome master in one's specialized echnology	√	√	√		√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
ecome updated with all the latest hanges in technological world.	√	√	√		√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
bility to communicate efficiently.	√		√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
nack to be a multi-skilled engineer ith good technical knowledge, anagement, leadership and ntrepreneurship skills.	√	√	√	√	√	√	√		√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
bility to identify, formulate and odel problems and find ngineering solution based on a stems approach.	√	√	√		√	√	√		√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
apability and enthusiasm for self-nprovement through continuous rofessional development and life-ng 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

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Kapurthala

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MTME-201 RESEARCH METHODOLG

COURSE OUTCOME	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	SKILL	Focus on empolyability/ entrepenship	Assessment tools to measure attainmentt of CO
CO1: Formulate the research problem	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2: Carry out the different experimental designs and their analysis.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO3: Apply different statistical tools for the research analysis	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO4: Follow research ethics.	√		√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
MTME –202 ADVANCED WELDING TECHNOLOGY															
CO1: Describe metal transfer mechanism and classify different type of welding process on the basis of heat sources ·	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2: Analyze the mechanism of modern welding process and their parameters and control	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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CO3: Explain the influence of heat input and temperature distribution across a welded structure based on weld geometry.	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO4: Illustrate the consumables and welding power sources used for welding.	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
MTME –203 CORROSION SCIENCE															
CO1. Theoretical knowledge of electrochemistry and its association with corrosion	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2. The student is trained in distinguishing between the different corrosion forms and in proposing proper measures of prevention, right design and treatment	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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O3. The student acquires nowledge about the main orrosion forms of major lloy families, the respective outes of corrosion revention, protection and anagement.	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4. The student acquires nowledge of the effect of arious environments on orrosion	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
MTME – 204 ADVANCED MATERIAL CHARACTERIZATION TECHNIQUES															
O1: Understand various naterials characterization echniques.	√	√	√	√		√	√		√	√	√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2: Comprehend the rinciple and operation of naracterization equipment	√	√	√	√		√	√	√	√		√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3: Decide the naracterization tool for pecific application	√	√	√	√		√	√	√	√		√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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O4: Compare the principle nd operation of different haracterization tools such s optical microscope, canning electron nicroscopes and ransmission electron nicroscope	√	√	√	√		√	√	√	√		√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5: Interpret the results of arious characterization echniques	√	√	√	√		√	√	√	√		√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME-205 TRIBOLOGY															
O1. Apply the basic heories of friction, wear nd lubrication to redictions about the rictional behavior of ommonly encountered iding interfaces	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2. Characterize features f rough surface and liquid ubricants as they pertain to nterface sliding.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3. Interpret the latest esearch on new topics in ribology including its pplication to nanoscale evices and biological ystems	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME – 206 AUTOMATION AND ROBOTICS															

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O1 Demonstrate nowledge of the elationship between echanical structures of dustrial robots and their perational workspace haracteristics		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2. Apply spatial ransformation to obtain orward kinematics quation of robot anipulators.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3. Solve inverse nematics of simple robot anipulators.		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4. Obtain the Jacobian atrix and use it to identify ngularities.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5. Generate joint ajectory for motion anning	√	√		√	√	√		√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O6. Demonstrate nowledge of robot ntrollers		√	√	√	√	√		√		√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
TME-207 PLASTIC ENGINEERING															
Knowledge of variety of ethods used to process ommercial plastic resins, cluding limitations		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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2. Knowledge of the basic cooling requirements for various plastic processing methods.		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
3. Ability to write professionally formatted summaries of plastic processing experiments.		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
4. Articulate the roll of additives in changing the performance of commercial resin systems		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
MTME – 208 RAPID PROTOTYPING															
CO1: Describe product development, conceptual design and classify rapid prototyping systems; explain stereo lithography process and applications	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2: Explain direct metal laser sintering, LOM and fusion deposition modeling processes		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO3: Demonstrate solid ground curing principle and process	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
MTME – 209 ADVANCED METAL CUTTING															
CO1.Overview of the principles of metal cutting	√	√	√			√	√		√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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CO2. Describe the methods of metal cutting	√	√	√			√	√		√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO3. Describe the cutting forces involved and their measurements	√	√	√	√			√		√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO4. Describe the parameters effecting tool forces	√	√	√		√	√	√	√		√		√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO5. Describe the theory/methods to find tool life.	√	√	√		√	√	√	√		√			understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
MTME-210 COMPUTER AIDED DESIGN & MANUFACTURING															
CO1 Understand the basic fundamentals of computer aided design and manufacturing	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2 To learn 2D & 3D transformations of the basic entities like line, circle, ellipse etc.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO3 To understand the different geometric modelling techniques like solid modelling, surface modelling, feature based modelling etc. and to visualize how the components look like before its manufacturing or fabrication	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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O4 To learn the part rogramming, importance f group technology, omputer aided process lanning, computer aided uality control	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5 To learn the overall onfiguration and elements f computer integrated anufacturing systems.	√	√		√		√	√	√	√	√	√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME – 211 MAINTENANCE AND RELIABILITY ENGINEERING															
O1. Understand the oncepts of Maintenance, eliability and Availability	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2. Establish maintenance rategies according to ystem characteristics and esign transition programs implement these rategies	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3. Develop fault trees for system and apply various eliability models on fault nalysis	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4. Develop hazard rate odels to know the ehaviour of components.		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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CO5. Manage the manufacturing organisation with highest possible availability.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
MTME – 212 SUPPLY CHAIN MANAGEMENT															
CO1 Explain the fundamentals of elements and functions of supply chain, role of drivers and demand forecasting. To understand how supply chain drivers play an important role in redefining value chain excellence of firms.	√		√		√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2 Apply various techniques of inventory management and their practical situations.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO3 Analyze how supply chain decisions related to facility location can be applied to various industries and designing the supply chain	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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CO4 How various warehousing management system and transportation can be practiced in various industries?	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO5 How supply chain performance can be measured using various models?	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
MTME-213 PRODUCTION PLANNING AND CONTROL															
CO1: Forecast the appropriate requirement of resources for various production processes and other shop floor activities.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2: Design an appropriate strategy for resource planning through appropriate MRP tool	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO3: Improve the productivity of shop floor through design of appropriate production systems such as mass production, batch production etc. within existing conditions.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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O4: Apply scientific tools uch as MRP, JIT optimizing roduction systems.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME – 214 PRODUCT DESIGN AND DEVELOPMENT															
O1. Learn the importance f product design in ndustry and principal equirements of good roduct design.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2. Learn the knowledge bout the ergonomic factor n product design and roduct design nethodology and echniques.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3. Learn the knowledge bout the basic elements nd concepts of visual esign	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4. Learn the importance f product graphics, roduct development and ackaging of materials	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5. Learn how the product esign helps in to reduce ne time to launch product n marke	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME-215 ENTREPRENEURSHIP															

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O1 Gain knowledge of iscovering opportunities nd basic entrepreneurial ssues	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2 Develop critical hinking skills on developing career as entrepreneurs nd define the concept of ntrepreneurship.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3 Understand strategic ecisions that ntrepreneurs need to ake and the ability to ngage in strategic lanning.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4 Develop the ability to olve real life ntrepreneurship issue and mall/ Medium Business roblems	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4 Develop the ability to olve real life ntrepreneurship issue and mall/ Medium Business roblems	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME-216 WORK SYSTEM DESIGN AND ERGONOMICS															

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. To provide basic nderstanding to the tudents about the concept nd significance of work tudy and ergonomics.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
. To impart thorough nowledge to the students bout various techniques of ork-study for improving ne productivity of an rganization	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
. To inculcate the skill mong the students for nalyzing and improving xisting methods of working n the shop floor of an rganization	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
. To impart through nowledge and skills to udents with respect to lowances, rating, lculation of basic and andard time for manual perations in an rganization	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME-217 METROLOGY AND INDUSTRIAL AUTOMATION															

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Study the characteristics nd specification of struments		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Understand the sensors nd transducers used in anufacturing industries e displacement, velocity, celeration, force, torque nd load		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Grasp the world class dustrial safety aspect miliar with various tomation technologies in anufacturing and process dustries.		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Understand various tomation tools and ethods in manufacturing dustry	√	√	√		√	√	√	√		√			understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Implement various ntrol and automation ethod in process dustries.	√	√	√		√	√	√	√		√		√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
TME-218 FINITE ELEMENT ANALYSIS															
01: To explain the ncepts behind rmulation methods in M.	√	√	√		√	√	√	√		√			understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

O2: To identify the pplication and haracteristics of FEA ements such as bars, eams, plane and iso-arametric elements.	√	√	√		√	√	√	√		√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3: To develop element haracteristic equation and eneration of global quation.	√	√		√	√	√	√		√	√	√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4: To apply suitable oundary conditions to a obal equation for bars, usses, beams, circular hafts, heat transfer, fluid ow, axi-symmetric and ynamic problems and solve hem for displacements, tress and strains induced.	√	√		√		√		√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME-219 LOW COST AUTOMATION															
O1 Understand the types f automation and its arious elements.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2 Select various omponents for low-cost utomation systems.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
3 Do some assembly utomation	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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TME-201 RESEARCH METHODOLG															
OURSE OUTCOME	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	SKILL	Focus on empolyability/ entrepenship	Assessment tools to measure attainmentt of CO
O1: Formulate the esearch problem	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2: Carry out the different xperimental designs and heir analysis.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3: Apply different tatistical tools for the esearch analysis	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4: Follow research ethics.	√		√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME –202 ADVANCED WELDING TECHNOLOGY															
O1: Describe metal ransfer mechanism and lassify different type of elding process on the asis of heat sources	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2: Analyze the echanism of modern elding process and their arameters and control	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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O3: Explain the influence f heat input and mperature distribution cross a welded structure ased on weld geometry.	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4: Illustrate the onsumables and welding ower sources used for elding.	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
TME –203 CORROSION SCIENCE															
O1. Theoretical knowledge f electrochemistry and its ssociation with corrosion	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2. The student is trained distinguishing between he different corrosion orms and in proposing roper measures of revention, right design and reatment	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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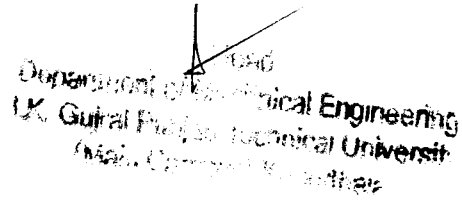
CO3. The student acquires knowledge about the main corrosion forms of major alloy families, the respective routes of corrosion prevention, protection and management.	√	√	√	√	√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO4. The student acquires knowledge of the effect of various environments on corrosion	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
MTME – 204 ADVANCED MATERIAL CHARACTERIZATION TECHNIQUES															
CO1: Understand various materials characterization techniques.	√	√	√	√		√	√		√	√	√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2: Comprehend the principle and operation of characterization equipment	√	√	√	√		√	√	√	√		√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO3: Decide the characterization tool for specific application	√	√	√	√		√	√	√	√		√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams



CO4: Compare the principle and operation of different characterization tools such as optical microscope, scanning electron microscopes and transmission electron microscope	√	√	√	√		√	√	√	√		√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO5: Interpret the results of various characterization techniques	√	√	√	√		√	√	√	√		√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
MTME-205 TRIBOLOGY															
CO1. Apply the basic theories of friction, wear and lubrication to predictions about the frictional behavior of commonly encountered sliding interfaces	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2. Characterize features of rough surface and liquid lubricants as they pertain to interface sliding.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO3. Interpret the latest research on new topics in tribology including its application to nanoscale devices and biological systems	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
MTME – 206 AUTOMATION AND ROBOTICS															

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O1 Demonstrate nowledge of the elationship between echanical structures of dustrial robots and their perational workspace haracteristics		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2. Apply spatial ransformation to obtain orward kinematics quation of robot anipulators.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3. Solve inverse nematics of simple robot anipulators.		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4. Obtain the Jacobian atrix and use it to identify ngularities.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5. Generate joint ajectory for motion lanning	√	√		√	√	√		√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O6. Demonstrate nowledge of robot ontrollers		√	√	√	√	√		√		√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME-207 PLASTIC ENGINEERING															
. Knowledge of variety of ethods used to process ommercial plastic resins, ncluding limitations		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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Knowledge of the basic ooling requirements for arious plastic processing ethods.		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Ability to write rofessionally formatted ummaries of plastic rocessing experiments.		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Articulate the roll of dditives in changing the erformance of commercial esin systems		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME – 208 RAPID PROTOTYPING															
O1: Describe product evelopment, conceptual esign and classify rapid rototyping systems; xplain stereo lithography rocess and applications	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2: Explain direct metal ser sintering, LOM and sion deposition modeling rocesses		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3: Demonstrate solid round curing principle and rocess	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME – 209 ADVANCED METAL CUTTING															
O1.Overview of the rinciples of metal cutting	√	√	√			√	√		√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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O2. Describe the methods f metal cutting	√	√	√			√	√		√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3. Describe the cutting orces involved and their neasurements	√	√	√	√			√		√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4. Describe the arameters effecting tool orces	√	√	√		√	√	√	√		√		√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5. Describe the neory/methods to find tool fe.	√	√	√		√	√	√	√		√			understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME-210 COMPUTER AIDED DESIGN & MANUFACTURING															
O1 Understand the basic undamentals of computer ded design and anufacturing	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2 To learn 2D & 3D ansformations of the basic ntities like line, circle, lipse etc.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3 To understand the fferent geometric odelling techniques like olid modelling, surface odelling, feature based odelling etc. and to sualize how the mponents look like efore its manufacturing or brication	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5 To learn the overall onfiguration and elements f computer integrated nanufacturing systems.	√	√		√		√	√	√	√	√	√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME – 211 MAINTENANCE AND RELIABILITY ENGINEERING															
O1. Understand the oncepts of Maintenance, eliability and Availability	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2. Establish maintenance trategies according to ystem characteristics and esign transition programs o implement these trategies	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3. Develop fault trees for system and apply various eliability models on fault nalysis	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4. Develop hazard rate odels to know the ehaviour of components.		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5. Manage the anufacturing organisation ith highest possible vailability.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
TME – 212 SUPPLY CHAIN MANAGEMENT															

O1 Explain the ndamentals of elements nd functions of supply ain, role of drivers and emand forecasting. To nderstand how supply ain drivers play an nportant role in redefining alue chain excellence of rms.	√		√		√	√	√	√	√		√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2 Apply various echniques of inventory anagement and their ractical situations.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3 Analyze how supply ain decisions related to cility location can be pplied to various industries nd designing the supply ain	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4 How various arehousing management stem and transportation an be practiced in various dustries?	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5 How supply chain erformance can be easured using various odels?	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

MTME-213 PRODUCTION PLANNING AND CONTROL															
CO1: Forecast the appropriate requirement of resources for various production processes and other shop floor activities.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2: Design an appropriate strategy for resource planning through appropriate MRP tool	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO3: Improve the productivity of shop floor through design of appropriate production systems such as mass production, batch production etc. within existing conditions.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO4: Apply scientific tools such as MRP, JIT optimizing production systems.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
MTME – 214 PRODUCT DESIGN AND DEVELOPMENT															
CO1. Learn the importance of product design in industry and principal requirements of good product design.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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02. Learn the knowledge bout the ergonomic factor product design and oduct design ethodology and chniques.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
03. Learn the knowledge bout the basic elements nd concepts of visual esign	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
04. Learn the importance product graphics, oduct development and ackaging of materials	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
05. Learn how the product esign helps in to reduce e time to launch product marke	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
TME-215 ENTREPRENEURSHIP															
01 Gain knowledge of scovering opportunities nd basic entrepreneurial sues	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
02 Develop critical inking skills on developing career as entrepreneurs nd define the concept of ntrepreneurship.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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To inculcate the skill nong the students for nalyzing and improving kisting methods of working n the shop floor of an rganization	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
To impart through nowledge and skills to udents with respect to lowances, rating, lculation of basic and andard time for manual perations in an rganization	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME-217 METROLOGY AND INDUSTRIAL AUTOMATION															
Study the characteristics nd specification of struments		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Understand the sensors nd transducers used in anufacturing industries ke displacement, velocity, cceleration, force, torque nd load		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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O3 Understand strategic ecisions that ntrepreneurs need to ake and the ability to ngage in strategic anning.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4 Develop the ability to lve real life ntrepreneurship issue and mall/ Medium Business roblems	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4 Develop the ability to lve real life ntrepreneurship issue and mall/ Medium Business roblems	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
TME-216 WORK SYSTEM DESIGN AND ERGONOMICS															
To provide basic nderstanding to the udents about the concept nd significance of work udy and ergonomics.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
To impart thorough nowledge to the students bout various techniques of ork-study for improving he productivity of an rganization	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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Lucknow (U.P.)

O4: To apply suitable oundary conditions to a obal equation for bars, usses, beams, circular afts, heat transfer, fluid ow, axi-symmetric and ynamic problems and solve em for displacements, ress and strains induced.	√	√		√		√		√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
TME-219 LOW COST AUTOMATION															
O1 Understand the types f automation and its arious elements.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2 Select various omponents for low-cost utomation systems.	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
3 Do some assembly utomation	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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Grasp the world class dustrial safety aspect miliar with various utomation technologies in anufacturing and process dustries.		√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Understand various utomation tools and ethods in manufacturing dustry	√	√	√		√	√	√	√		√			understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Implement various ontrol and automation ethod in process dustries.	√	√	√		√	√	√	√		√		√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
ITME-218 FINITE ELEMENT ANALYSIS															
O1: To explain the oncepts behind ormulation methods in EM.	√	√	√		√	√	√	√		√			understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2: To identify the pplication and haracteristics of FEA ements such as bars, eams, plane and iso-arametric elements.	√	√	√		√	√	√	√		√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3: To develop element haracteristic equation and eneration of global quation.	√	√		√	√	√	√		√	√	√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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Research Methodology (Phd. Course Work)

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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

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CO6: Familiarity and application of various thermal energy based non-conventional machining processes.	√		√	√	√	√	√	√	√	√		√	Applying and Designing	Yes	Minor Exams, Assignments, En 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 Measu Attainment of CO**
CO1: Deal with nerves and think more positively about public speaking.	√	√	√		√	√	√	√	√	√	√	√	Thinking	Yes	Field based assignments, Repo making, presentations etc.
CO 2: Consider ways of grabbing the listener's attention, holding their interest, and concluding strongly.	√		√			√	√	√	√	√	√	√	Thinking	Yes	Field based assignments, Repo making, presentations etc.
CO3: Use body language and tone of voice to enhance their presentations.			√		√	√	√	√	√	√	√	√	Applying	Yes	Field based assignments, Repo making, presentations etc.
CO4: Use slides and visual aids effectively.	√	√	√		√	√	√	√	√	√	√	√	Applying	Yes	Field based assignments, Repo making, presentations etc.
CO5: Deliver an enthusiastic and well-practised presentation.	√	√	√		√	√	√	√	√	√	√	√	Applying	Yes	Field based assignments, Repo 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 Measu Attainment of CO**
CO1: Understand the principles of heat transfer through conduction, convection and radiation modes.	√	√	√		√	√	√		√	√	√	√	Thinking	Yes	Field based assignments, Repo making, presentations etc.
CO2: Understand the heat transfer during phase-change processes, such as boiling and condensation.	√	√	√			√		√	√	√	√	√	Thinking	Yes	Field based assignments, Repo 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, Repo making, presentations etc.
CO4: Understand the concept related to mass transfer and its connection with heat transfer.		√	√		√	√	√	√		√	√	√	Applying	Yes	Field based assignments, Repo making, presentations etc.

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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.

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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.

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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.

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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.	√	√	√	√		√	√			√	√	√	Applyin	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**

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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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