

1.1.3

**Supporting Documents-**  
**Department of Mechanical**  
**Engineering**

**Mapping of Courses to Employability/ Skill  
Development**



## 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	PO10	PO11	PO12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure 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, Business Qu 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, Business 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, Business 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, Business 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, Business Qu Assignments,End Term Exa

BTAMXX-18 - Maths-1

**Department of Mechanical Engineering**  
**LK. Ganga Prasad Jais University**  
 Mysuru

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

**BTEE101-18 Basic Electrical Engineering**

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

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

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 Measure 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, Business Quizzes, Assignments, End Term Exams
CO 2: Be able to analyze of DC circuits, AC Circuits		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Business Quizzes, Assignments, End Term Exams
CO 3: Understand the basic magnetic circuits and apply it to the working of electrical machines		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Business Quizzes, Assignments, End Term Exams

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 / Entrepreneurshin	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 Qu 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 Qu Assignments,End Term Exa
CO 3: Have the knowledge of electrical machines, components and their ratings		✓	✓		✓		✓	✓	✓	✓	✓	✓	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa
CO 4: Understand the operation of transformers and electrical machines		✓	✓		✓		✓	✓		✓		✓	Understanding	Yes	Minor Exams, Buisness Qu Assignments,End Term Exa

**Paper BTME101-18 Engineering Graphics & Design**

Department Head  
 Department of Mechanical Engineering  
 I.K.C. Papat Campus  
 Kapurthala  
 Engineering University

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 / Entrepreneurshin	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.S. 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 Measure Attainment of CO
CO1: The student will be able to effectively communicate and present technical material.	√	√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Business Quizzes, Assignments, End Term Exams
CO2: Ability to think critically and creatively to generate innovative and optimum solutions.		√	√		√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Business Quizzes, 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, Business Quizzes, 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, Business Quizzes, Assignments, End Term Exams

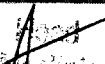
Department of Mechanical Engineering  
I.K.S. P.T.U. Main Campus  
Kapurthala

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

**BTCH102-18 - Chemistry Lab**

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

  
 Department of Mechanical Engineering  
 A.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 Measure 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 / Entrepreneurshin	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  
I.K.G. P.T.U. Main Campus  
Kapurthala

**BTPS101-18 Programming for Problem Solving**

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 Measure Attainment of CO
To formulate simple algorithms for arithmetic and logical problems.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Understanding	Yes	Minor Exams, Business Quizzes, Assignments, End Term Exams
To translate the algorithms to programs (in C language).		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Understanding	Yes	Minor Exams, Business Quizzes, Assignments, End Term Exams
To test and execute the programs and correct syntax and logical errors.		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Understanding	Yes	Minor Exams, Business Quizzes, Assignments, End Term Exams
To implement conditional branching, iteration and recursion.		✓	✓		✓	✓		✓		✓		✓	Understanding	Yes	Minor Exams, Business Quizzes, Assignments, End Term Exams
To decompose a problem into functions and synthesize a complete program using divide and conquer approach.		✓	✓		✓	✓		✓		✓		✓	Understanding	Yes	Minor Exams, Business Quizzes, Assignments, End Term Exams
To use arrays, pointers and structures to formulate algorithms and programs.		✓	✓		✓	✓		✓		✓		✓	Understanding	Yes	Minor Exams, Business Quizzes, Assignments, End Term Exams
To apply programming to solve matrix addition and multiplication problems and searching and sorting problems.		✓	✓		✓	✓		✓		✓		✓	Understanding	Yes	Minor Exams, Business Quizzes, Assignments, End Term Exams
To apply programming to solve simple numerical method problems, namely root finding of function, differentiation of function and simple integration.		✓	✓		✓	✓		✓		✓		✓	Understanding	Yes	Minor Exams, Business Quizzes, Assignments, End Term Exams

  
 Department of Mechanical Engineering  
 LK. P.T.U. Main Campus  
 Kapurthala

  
 Department of Mechanical Engineering  
 LK. Guraj Prasad  
 (Main Campus) Kapurthala  
 Punjab Technical University



**BTPS102-18 Programming for Problem Solving Lab**

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

Department of Mechanical Engineering  
 L.K. Gujral Punjab Technical University  
 Kapurthala Campus

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

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 Employabilit y / 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**

Department of Mechanical Engineering  
 I.K.C. PT. Department of Mechanical Engineering  
 LK. Guraj Prasad Technical University  
 (Main Campus) Kaptipada

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 / 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 le Assignments,End Term Exa
Students will acquire basic proficiency in reading & listening, comprehension, writing and speaking skills.	√	√	√	√	√	√	√				√	√	√	Apply	Yes	Minor Exams, Project based le 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 le Assignments,End Term Exa
They will be able to converse fluently.	√	√	√	√	√	√	√				√		√	Apply	Yes	Minor Exams, Project based le 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	PO1 0	PO1 1	PO1 2	Skill	Focus on Employabilit y / Entrepreneu rshin	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 Mechanical Engineering  
I.K.G. P.T.U. 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**

  
 Department of Mechanical Engineering  
 I.K.G. P.T.I. Campus  
 Karur  
 Engineering  
 University  
 Karur

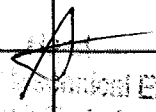
Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employabilit y / Entrepreneu rshin	Assessment Tools to Mea Attainment of CO
----------------	------	------	------	------	------	------	-----	-----	-----	-------	-------	-------	-------	--	---

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**

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

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


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

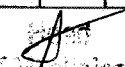
CO4: Understand the function of brakes, dynamometers, flywheel and governors.	✓	✓	✓	✓	✓	✓					✓		✓	✓	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
---	---	---	---	---	---	---	--	--	--	--	---	--	---	---	-------------------------	-----	-------------------------------------

**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 Measure Attainment of CO
CO1: Read, draw and interpret the machine drawings and related parameters.	✓	✓	✓							✓	✓	✓	Understanding	Yes	Minor Exams, Class and Home Assignments, End Term Exams
CO2: Use standards used in machine drawings of machine components and assemblies.	✓	✓	✓							✓	✓		Applying	Yes	Minor Exams, Class and Home Assignments, End Term Exams
CO3: Learn the concept of limits, fits and tolerances in various mating parts.	✓	✓	✓							✓	✓		Understanding	Yes	Minor Exams, Class and Home Assignments, End Term Exams
CO4: Visualize and generate different views of a component in the assembly.	✓	✓	✓		✓					✓	✓	✓	Applying	Yes	Minor Exams, Class and Home Assignments, End Term Exams
CO5: Use CAD tools for making drawings of machine components and assemblies.	✓	✓	✓		✓					✓	✓	✓	Applying	Yes	Minor Exams, Class and Home Assignments, End Term Exams

**BTME304-18 STRENGTH OF MATERIALS-I**

  
 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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the concepts of stress and strain at a point, in the members subjected to axial, bending, torsional loads and temperature changes.	√	√	√			√			√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End 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  
 IKG 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 Measure Attainment of CO
Understand construction of diodes and their rectifier applications.	√	√	√			√			√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Exams

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

**Paper Basic Thermodynamics BTME 305-18**

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

**BTME306-18 Strength of Material Lab**

  
 HOD  
 Department of Mechanical Engineering  
 P.T.U. Main Campus  
 Kapurthala  
 Department of Mechanical Engineering  
 J.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 Measure 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	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand constructional and working features of important machine elements.	√	√	√	√	√	√			√		√	√	Understanding	Yes	Minor Exams, Assignments, Exams
CO2: Design belt, rope and chain drives for transmission of motion from one shaft to															
another	√	√	√	√	√	√			√		√	√	Designing	Yes	Minor Exams, Assignments, Exams
CO3: Identify different Cam and follower pairs for different applications and construct cam															

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

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

profile for required follower motion.	√	√	√	√	√	√				√		√	√	Designing	Yes	Minor Exams, Assignments, End Exams
CO4: Understand the function of brakes, dynamometers, flywheel and governors.	√	√	√	√	√	√				√		√	√	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams

**Paper BTME308-18 Fluid Mechanics Lab**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure 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, Business Quizzes, Assignments, End Term Exams
CO 2: Determine discharge and head loss, hydraulic and friction coefficient, for different															
types of flow in pipe and open channels.							√		√	√		√	Analyse	Yes	Minor Exams, Business Quizzes, Assignments, End Term Exams

**BMPD301-18 Mentoring and professional Development**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: The student will be able to effectively communicate and present technical material.	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	Understanding	Yes	Minor Exams, Business Quizzes, Assignments, End Term Exams
CO2: Ability to think critically and creatively to generate innovative and optimum solutions.		✓	✓		✓		✓	✓	✓	✓	✓	✓	Understanding	Yes	Minor Exams, Business Quizzes, 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, Business Quizzes, 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, Business Quizzes, Assignments, End Term Exams

**BTME401-18 APPLIED THERMODYNAMICS**

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

Course Outcome	PO 1 (Engineering)	PO 2 (Problem Solving)	PO 3 (Design)	PO 4 (Conduct)	PO 5 (Modelling)	PO 6 (Thermodynamics)	PO 7 (Environment)	PO 8 (Ethics)	PO 9 (Individual)	PO 10 (Communication)	PO 11 (Project Management)	PO 12 (Lifelong Learning)	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Explain the functioning and performance evaluation of reciprocating air compressors.	✓		✓	✓	✓	✓	✓		✓	✓		✓	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End Term Exams
CO 2: Analyze the combustion phenomenon in boilers and I.C. engines.	✓	✓		✓	✓	✓	✓	✓	✓	✓			Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End Term Exams

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

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

**Paper BTME 402-18 Fluid Machines**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure 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, Assignments, Powerpoint Presentations, Numericals 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, Assignments, Powerpoint Presentations, Numericals etc.
CO 3: Know about constructional details, working and evaluate the performance of centrifugal pump under different vane shape conditions.	✓	✓	✓			✓	✓		✓	✓		✓	Knowledge	Yes	Lectures, Tutorials, Assignments, Powerpoint Presentations, Numericals 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, Assignments, Powerpoint Presentations, Numericals etc.

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

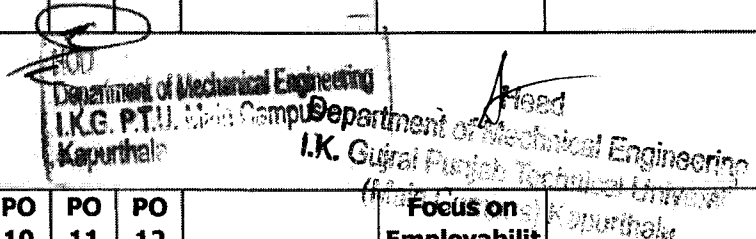
Head  
Department of Mechanical Engineering  
L.K. Gujral Punjab Technical University  
(Main Campus) Kapurthala

**BTME403-18 STRENGTH OF MATERIALS-II**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the concepts of stress and strain at a point, in the members subjected to axial, bending, torsional loads and temperature changes.	√	√	√			√			√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End 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

**BTME404-18 MATERIALS ENGINEERING**

Course Outcome	PO 1 (Engineering)	PO 2 (Professional)	PO 3 (Design/Dev)	PO 4 (Communication)	PO 5 (Management)	PO 6 (Teamwork)	PO 7 (Entrepreneurship)	PO 8 (Ethics)	PO 9 (Individual)	PO 10 (Communication)	PO 11 (Project Management)	PO 12 (Lifelong Learning)	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO


  
 Department of Mechanical Engineering  
 I.K.G. P.T.U. Main Campus  
 Kapurthala  
 Department of Mechanical Engineering  
 I.K. Gujral Punjab Technical University  
 Kapurthala

CO1: Illustrate the significance of structure-property-correlation for engineering materials including ferrous and nonferrous.	✓	✓		✓	✓	✓	✓		✓	✓	✓	✓	Underst. ing, 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**

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

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the 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

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

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

**BTME406-18 APPLIED THERMODYNAMICS Lab**

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

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

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

**Paper BTME407-18 Fluid Machines Lab**

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


Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: 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 etc
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 etc



**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 Measure 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.I., Bina 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 Measure Attainment of CO
CO1: The student will be able to effectively communicate and present technical material.	✓	✓	✓		✓		✓	✓	✓	✓	✓	✓	Understanding	Yes	Minor Exams, Business Quiz, Assignments, End Term Exams
CO2: Ability to think critically and creatively to generate innovative and optimum solutions.		✓	✓		✓		✓	✓	✓	✓	✓	✓	Understanding	Yes	Minor Exams, Business 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, Business 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 (Thermal Engi)	PO 7 (Environment)	POB (Ethics)	PO 9 (Individual)	PO 10 (Communication)	PO 11 (Project Man)	PO 12 (Life long)	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure 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  
 V.C.P.T.U. Main Campus  
 Raipur

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: 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 Term Exams
CO2: Comprehend the effect of different stresses and strains under various loading conditions on the mechanical components and identify the mechanism/mode of failure	✓	✓	✓	✓	✓	✓				✓	✓	✓	Understanding and Applying	Yes	Minor Exams, Assignments, End Term 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 Term Exams
CO4: Synergize forces, moments and strength information to develop ability to analyze, design and/or select machine elements aiming for safety, reliability, and cost effectiveness	✓	✓	✓	✓	✓	✓				✓	✓	✓	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End Term Exams

**Paper BTME 503-18 Manufacturing Processes**

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

Head  
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 Measure 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	PO10	PO11	PO12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Explain the development of management and the role it plays at different levels in an organization.	√						√	√	√	√	√	√	Understanding	Yes	Minor Exams, Business 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, Business 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, Business 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, Business 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, Business 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, Business Quiz, Assignments, End Term Exam

**Paper BTME 503-18 Heat Transfer Lab**

Department of Mechanical Engineering  
 I.K.G. P.T.U. Jalandhar  
 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 Measure 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 / Entrepreneurship	Assessment Tools to Measure 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, Business 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, Business 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, Business 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, Business Quiz, End Exams

**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 Measure Attainment of CO
Understand different implementation modes of numerical methods.	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	Applying	Yes	Minor Exams, Business Quiz, End Exams
Use the numerical methods with the understanding of limitations of these methods for solving problems.	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	Applying	Yes	Minor Exams, Business Quiz, End Exams
Develop and implement their own computer programs.	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	Applying	Yes	Minor Exams, Business Quiz, End Exams
Solve problems more accurately and efficiently in low computational time.	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	Applying	Yes	Minor Exams, Business Quiz, End Exams
Handle the problems conveniently which are difficult to deal with manually	✓	✓	✓	✓	✓	✓	✓			✓	✓	✓	Applying	Yes	Minor Exams, Business Quiz, End Exams

**Paper BTMC102-18 ESSENCE OF INDIAN KNOWLEDGE TRADITION**

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

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

Understand the Philosophy of Indian Knowledge system and its Basic Structure.	√	√	√	√	√	√	√				√	√	√	Applying	Yes	Minor Exams, Business Quiz, End Exams
Understand the Ancient India Culture, Society and Religion.	√	√	√	√	√	√	√				√	√	√	Applying	Yes	Minor Exams, Business Quiz, End Exams
Examine the areas of Indian Linguistic Tradition.	√	√	√	√	√	√	√				√	√	√	Applying	Yes	Minor Exams, Business Quiz, End Exams
Know the contribution of scientists of different eras.	√	√	√	√	√	√	√				√	√	√	Applying	Yes	Minor Exams, Business Quiz, End Exams
Handle the problems conveniently which are difficult to deal with manually	√	√	√	√	√	√	√				√	√	√	Applying	Yes	Minor Exams, Business 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	PO10	PO11	PO12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO	
Capability to acquire and apply fundamental principles of engineering.	√	√	√	√	√	√	√				√	√	√	Applying	Yes	Minor Exams, Business Quiz, End Exams
Become master in one's specialized technology	√	√	√	√	√	√	√				√	√	√	Applying	Yes	Minor Exams, Business Quiz, End Exams

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

**ME601-18 REFREGERATION AND AIR CONDITIONING**

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

  
 Department of Mechanical Engineering  
 LK. 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	Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the fundamental principles and applications of refrigeration and air conditioning system	✓	✓	✓	✓	✓		✓	✓	✓	✓	✓	✓	Understanding	Yes	Minor Exams, Assignments, End 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 environmental 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

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 Measure 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.

PO 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 (Environment)	PO8 (Ethics)	PO 9 (Individual)	PO 10 (Communic)	PO 11 (Project Man)	PO 12 (Life long)	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Identify the different parts of the automobile.	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End Term Exams
CO 2: Demonstrate the working of various parts like engine, transmission, clutch, brakes, steering and the suspension systems.	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Understanding, Applying	Yes	Minor Exams, Assignments, End Term Exams
CO 3: Explain the need of vehicle safety systems and future developments in the automobile industry.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Understanding, Applying	Yes	Minor Exams, Assignments, End Term Exams

**Paper BTME 604-18 Introduction to Industrial Management**

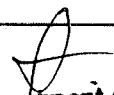
Department of Mechanical Engineering  
I.K.G. P.T.  
Kapurthala

Department of Mechanical Engineering  
L.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 Measure 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, Business 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**

  
 Head  
 Department of Mechanical Engineering  
 K. Gujral Purjati Technical University  
 (Main Campus) Kapurthala  
 Department of Mechanical Engineering  
 K.G.P.T.U. Main Campus  
 Kapurthala

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the fundamental principles and applications of refrigeration and air conditioning system	√	√	√	√	√		√	√	√	√	√	√	Understanding	Yes	Minor Exams, Assignments, End Term 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 Term 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 Term Exams
CO4: The students will be able to explain the properties, applications and environmental issues of different refrigerants.	√	√		√	√	√		√	√	√		√	Applying and Designing	Yes	Minor Exams, Assignments, End Term 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 Term 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	PO10	PO11	PO12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Demonstrate the use of instruments for measuring linear (internal and external), angular dimensions and surface roughness.	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	Understanding	Yes	Case Study, Group Discussions,
CO 2: Identify proper measuring instrument and know requirement of calibration, errors in measurement etc.	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	Knowledge	Yes	Case Study, Group Discussions,
CO 3: Apply analytical and experimental methods to make measurements and to find and correct defects in measurement systems.	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	Applying	Yes	Case Study, Group Discussions,

**BTME603-18 AUTOMOBILE ENGINEERING LAB**

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 (Engineering)	PO 2 (Professional)	PO 3 (Design/Development)	PO 4 (Conduct)	PO 5 (Modern)	PO 6 (Theoretical)	PO 7 (Environmental)	PO8 (Ethics)	PO 9 (Individual)	PO 10 (Communication)	PO 11 (Project Management)	PO 12 (Life Long)	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Identify the different parts of the automobile.	✓		✓	✓	✓	✓	✓		✓	✓	✓	✓	Understanding, Applying and Designing	Yes	Minor Exams, Assignments, End T Exams
CO 2: Demonstrate the working of various parts like engine, transmission, clutch, brakes, steering and the suspension systems.	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Understanding, Applying	Yes	Minor Exams, Assignments, End T Exams

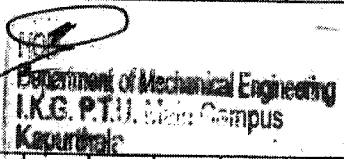
CO 3: Explain the need of vehicle safety systems and future developments in the automobile industry.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Understanding, Applying	Yes	Minor Exams, Assignments, End Exams
--	---	---	---	---	---	---	---	---	---	---	---	---	---	-------------------------	-----	-------------------------------------

**BTME-608-18 : Minor Project**

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

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO6	PO7	PO8	PO9	PO1 0	PO1 1	PO1 2	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Knowledge about the basics of IC engines	√	√	√	√			√		√	√		√	Understanding	Yes	Minor Exams, Quiz, demonstration through videos/ lab, End Term E
CO2: Ability to evaluate operational characteristics of IC Engines	√	√	√	√		√	√		√	√	√	√	Understanding	Yes	Minor Exams, Quiz, demonstration 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, demonstration through videos/ lab, End Term E
CO4: Ability to test engine performance		√	√	√	√		√	√		√		√	Applying		

**BTME-610-18 Mechatronics Systems**



Department of Mechanical Engineering  
I.K.G. 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 Measure Attainment of CO
CO1: Design mux, demux, flip-flops, and shift registers.		√	√	√	√		√	√	√	√	√		Applying and Designing	Yes	Minor Exams, Assignments, End Term 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 Term Exams

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

**BTME-611-18 Microprocessor in automation**

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

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

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

CS 305.6 Student is able to analyze and compare the features of microprocessors and microcontrollers.	√		√	√	√		√				√	√	Applying and Designing	Yes	Minor Exams, Assignments, End 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 (Th Engi)	PO 7 (Environme)	PO8 (Ethics)	PO 9 (Individual)	PO 10 (Communic)	PO 11 (Project Man)	PO 12 (Life Long)	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: 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. P.T.U. Main Campus  
Kapurthala

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

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: 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  
L.K. Gujral Punjab Engineering 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 Measure Attainment of CO
CO1: Understand desirable design aspects considering various production processes and also understand the economic factors of design.	√	√	√	√	√	√	√	√	√	√	√	√	Understanding	Yes	Minor Exams, Quiz, Assignments, Term Exams
CO 2: Employ engineering, scientific, and mathematical principles to execute a design from concept to finished product.	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Quiz, Assignments, Term Exams
CO 3: Apply the modern approaches to product design considering concurrent design, quality function deployment and various rapid prototyping methods.	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Quiz, Assignments, Term Exams
CO 4: Apply innovative process techniques in synthesizing information, problem-solving and critical thinking.	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Minor Exams, Quiz, Assignments, Term Exams

**BTME 615-18 : Non Conventional Energy Resources**

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

**BTME616-18 : OPERATION RESEARCH**

  
 Department of Mechanical Engineering  
 I.K.C.P.T.  
 Kavarathala

  
 Department of Mechanical Engineering  
 I.K.C.P.T.  
 Kavarathala

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

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

**BTME617-18: MAINTENANCE & RELIABILITY**

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

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

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the concepts of reliability and maintainability	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Understanding	Yes	Minor Exams, Assignments, End Term 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 Term 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 Term 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 Measure Attainment of CO
CO1: Formulate mathematical models of problems in vibrations using Newton's second law or energy	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	Understanding	Yes	Lectures, Tutorials, Assignment Powerpoint Presentations, Numer etc.
CO 2: Understand the need and measurement of vibration in mechanical systems.	✓	✓	✓	✓	✓	✓	✓		✓	✓	✓	✓	Understanding	Yes	Lectures, Tutorials, Assignment 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**

Department of Mechanical Engineering  
 P.T.II, Main Campus  
 Jodhpur

Department of Mechanical Engineering  
 P.T.II, Main Campus  
 Jodhpur

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO7	PO8	PO9	PO10	PO11	PO12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
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

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 Measure 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


Department of Mechanical Engineering  
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 Measure Attainment of CO
CO1: To create an Industrial environment and culture within the institution.	√		√		√	√	√	√	√	√	√	√	Understanding	Yes	Reports, Project Presentations and Viva
CO2: To set up production lab utilizing the infrastructure of the institution.	√	√	√		√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
CO3: To standardize laboratories to industrial standard, thereby giving exposure to industrial housekeeping standards.	√	√	√		√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
CO4: Demonstrate an ability to present and defend their research work to a panel of experts.	√		√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva
CO5: Demonstrate knowledge of contemporary issues in their chosen field of research.	√	√	√	√	√	√	√		√	√	√	√	Applying and Designing	Yes	Reports, Project Presentations and Viva

**BTME-801 Software/Industrial Training**

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

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

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

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



ME-201 RESEARCH METHODOLOGY


COURSE OUTCOME	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	SKILL	Focus on employability/ entrepreneurship	Assessment tools to measure attainment 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

ME-202 ADVANCED WELDING TECHNOLOGY

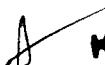
CO1: Describe metal transfer mechanism and classify different type of welding process on the basis of heat sources	√	√	√	√	√	√	√	√	√				understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2: Analyze the mechanism of modern welding process and their parameters and control	√	√	√	√	√	√	√	√	√				understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

Department of Mechanical Engineering  
 JEC Gujrat Punjab Technological University  
 (Main Campus) Gandhinagar

O3: 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
O4: Illustrate the consumables and welding power sources used for welding.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<b>ITME -203 CORROSION SCIENCE</b>																
O1. Theoretical knowledge of electrochemistry and its association with corrosion	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2. 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

  
 Department of Mechanical Engineering  
 Punjab Technical University  
 (Main Campus)

O3. 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
O4. 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
<b>BTME – 204 ADVANCED MATERIAL CHARACTERIZATION TECHNIQUES</b>																
O1: Understand various materials characterization techniques.	√	√	√	√		√	√		√	√	√			understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2: Comprehend the principle and operation of characterization equipment	√	√	√	√		√	√	√	√			√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3: Decide the characterization tool for specific application	√	√	√	√		√	√	√	√			√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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

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

**UNITME-205 TRIBOLOGY**

CO1. Apply the basic theories of friction, wear and lubrication to make 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

**UNITME – 206 AUTOMATION AND ROBOTICS**

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

01. Demonstrate knowledge of the relationship between mechanical structures of industrial robots and their operational workspace characteristics			√	√	√	√	√	√	√	√	√	√	√	understanding, applying and designing	yes	Minor exam, Business Quiz, assignments, End term Exams
02. Apply spatial transformation to obtain forward kinematics equation of robot manipulators.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding, applying and designing	yes	Minor exam, Business Quiz, assignments, End term Exams
03. Solve inverse kinematics of simple robot manipulators.		√	√	√	√	√	√	√	√	√	√	√	√	understanding, applying and designing	yes	Minor exam, Business Quiz, assignments, End term Exams
04. Obtain the Jacobian matrix and use it to identify singularities.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding, applying and designing	yes	Minor exam, Business Quiz, assignments, End term Exams
05. Generate joint trajectory for motion planning	√	√		√	√	√		√	√	√	√	√	√	understanding, applying and designing	yes	Minor exam, Business Quiz, assignments, End term Exams
06. Demonstrate knowledge of robot controllers		√	√	√	√	√		√		√	√	√	√	understanding, applying and designing	yes	Minor exam, Business Quiz, assignments, End term Exams

**TME-207 PLASTIC ENGINEERING**

Knowledge of variety of methods used to process commercial plastic resins, including limitations			√	√	√	√	√	√	√	√	√	√	√	understanding, applying and designing	yes	Minor exam, Business Quiz, assignments, End term Exams
--	--	--	---	---	---	---	---	---	---	---	---	---	---	---------------------------------------	-----	--

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

2. Knowledge of the basic tooling 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

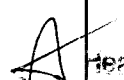
**MTME – 209 ADVANCED METAL CUTTING**

CO1.Overview of the principles of metal cutting			√	√	√			√	√			√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
---	--	--	---	---	---	--	--	---	---	--	--	---	---	---	---	---------------------------------------	-----	---

02. Describe the methods of metal cutting	✓	✓	✓			✓	✓		✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
03. Describe the cutting forces involved and their measurements	✓	✓	✓	✓			✓		✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
04. Describe the parameters effecting tool forces	✓	✓	✓		✓	✓	✓	✓		✓		✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
05. Describe the theory/methods to find tool life.	✓	✓	✓		✓	✓	✓	✓		✓			understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

**ATME-210 COMPUTER AIDED DESIGN & MANUFACTURING**

01 Understand the basic fundamentals of computer aided design and manufacturing	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
02 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
03 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

  
 1820  
 Department of Mechanical Engineering  
 Anna University  
 Chennai

O4 To learn the part programming, importance of group technology, computer aided process planning, computer aided quality control	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5 To learn the overall configuration and elements of computer integrated manufacturing systems.	√	√		√		√	√	√	√	√	√			understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams


**TIME – 211 MAINTENANCE AND RELIABILITY ENGINEERING**

O1. Understand the concepts of Maintenance, Reliability and Availability	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2. Establish maintenance strategies according to system characteristics and design transition programs to implement these strategies	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3. Develop fault trees for system and apply various reliability models on fault analysis	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4. Develop hazard rate models to know the behaviour of components.		√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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



O5. Manage the manufacturing organisation with highest possible availability.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams	
<b>MTME – 212 SUPPLY CHAIN MANAGEMENT</b>																	
O1 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
O2 Apply various techniques of inventory management and their practical situations.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams	
O3 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	

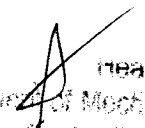
  
 Department of Mechanical Engineering  
 J.K. Gujral Punjab Technical University  
 (Main Campus) Jalandhar

Q04 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
Q05 How supply chain performance can be measured using various models?	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<b>BTME-213 PRODUCTION PLANNING AND CONTROL</b>															
Q01: 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
Q02: Design an appropriate strategy for resource planning through appropriate MRP tool	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Q03: 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

O4: Apply scientific tools such as MRP, JIT optimizing production systems.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<b>ITME – 214 PRODUCT DESIGN AND DEVELOPMENT</b>																
O1. 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
O2. Learn the knowledge about the ergonomic factor in product design and product design methodology and techniques.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3. Learn the knowledge about the basic elements and concepts of visual design	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4. Learn the importance of product graphics, product development and packaging of materials	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5. Learn how the product design helps in to reduce the time to launch product in market	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<b>ITME-215 ENTREPRENEURSHIP</b>																

CO1 Gain knowledge of discovering opportunities and basic entrepreneurial issues	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2 Develop critical thinking skills on developing career as entrepreneurs and define the concept of entrepreneurship.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO3 Understand strategic decisions that entrepreneurs need to make and the ability to engage in strategic planning.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO4 Develop the ability to solve real life entrepreneurship issue and small/ Medium Business problems	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO4 Develop the ability to solve real life entrepreneurship issue and small/ Medium Business problems	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<b>ITME-216 WORK SYSTEM DESIGN AND ERGONOMICS</b>																

To provide basic understanding to the students about the concept and significance of work study and ergonomics.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
To impart thorough knowledge to the students about various techniques of work-study for improving the productivity of an organization	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
To inculcate the skill among the students for analyzing and improving existing methods of working in the shop floor of an organization	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
To impart through knowledge and skills to students with respect to allowances, rating, calculation of basic and standard time for manual operations in an organization	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<b>BTME-217 METROLOGY AND INDUSTRIAL AUTOMATION</b>																

  
 Head  
 Department of Mechanical Engineering  
 U. P. J. S. (English) Technica. U. Varanasi  
 (U. P. J. S. Campus) Kashi-221005

Study the characteristics and specification of instruments		√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Understand the sensors and transducers used in manufacturing industries like displacement, velocity, acceleration, force, torque and load		√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Grasp the world class industrial safety aspect familiar with various automation technologies in manufacturing and process industries.		√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Understand various automation tools and methods in manufacturing industry	√	√	√		√	√	√	√		√				understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Implement various control and automation method in process industries.	√	√	√		√	√	√	√		√		√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<b>TME-218 FINITE ELEMENT ANALYSIS</b>																
Q1: To explain the concepts behind formulation methods in FEM.	√	√	√		√	√	√	√		√				understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

CO2: To identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements.	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO3: To develop element characteristic equation and generation of global equation.	✓	✓		✓	✓	✓	✓		✓	✓	✓		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO4: To apply suitable boundary conditions to a global equation for bars, trusses, beams, circular shafts, heat transfer, fluid flow, axi-symmetric and dynamic problems and solve them for displacements, stress and strains induced.	✓	✓		✓		✓		✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

**ITME-219 LOW COST AUTOMATION**

CO1 Understand the types of automation and its various elements.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2 Select various components for low-cost automation systems.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO3 Do some assembly automation	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

**ITME-201 RESEARCH METHODOLOGY**

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 employability/ entrepreneurship	Assessment tools to measure attainment 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


**ITME-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

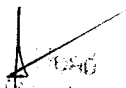
Department Head  
 Department of Mechanical Engineering  
 J.K. Gujral Punjab Technical University  
 (Main Campus) Jalandhar



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
<b>ITME –203 CORROSION SCIENCE</b>																
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

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

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
<b>ITME – 204 ADVANCED MATERIAL CHARACTERIZATION TECHNIQUES</b>																
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

  
 Department of Mechanical Engineering  
 U.K. Gujral Punjab Technical University  
 Moh. Ghazi Road, Jalandhar

O4: 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
O5: Interpret the results of various characterization techniques	√	√	√	√		√	√	√	√		√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

**TTME-205 TRIBOLOGY**

O1. 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
O2. 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
O3. 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

**TTME – 206 AUTOMATION AND ROBOTICS**

Head  
 Department of Mechanical Engineering  
 J.K. Gujral Punjab Technical University  
 Main Campus, Kapurthala

O1. Demonstrate knowledge of the relationship between mechanical structures of industrial robots and their operational workspace characteristics			√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2. Apply spatial transformation to obtain forward kinematics equation of robot manipulators.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3. Solve inverse kinematics of simple robot manipulators.		√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4. Obtain the Jacobian matrix and use it to identify singularities.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5. Generate joint trajectory for motion planning	√	√		√	√	√		√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O6. Demonstrate knowledge of robot controllers		√	√	√	√	√		√		√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<b>ITME-207 PLASTIC ENGINEERING</b>																
O7. Knowledge of variety of methods used to process commercial plastic resins, including limitations		√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

Department of Mechanical Engineering  
 J.K. Gujral Punjab Technical University  
 (Main Campus) Jalandhara

Knowledge of the basic tooling requirements for various plastic processing methods.			√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Ability to write professionally formatted summaries of plastic processing experiments.			√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
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

**ITME – 208 RAPID PROTOTYPING**

LO1: 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
LO2: Explain direct metal laser sintering, LOM and 3D printing processes				√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
LO3: Demonstrate solid ground curing principle and process			√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

**ITME – 209 ADVANCED METAL CUTTING**


LO1.Overview of the principles of metal cutting			√	√	√			√	√			√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
---	--	--	---	---	---	--	--	---	---	--	--	---	---	---	---	---------------------------------------	-----	---

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

Q02. Describe the methods of metal cutting	√	√	√			√	√		√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Q03. Describe the cutting forces involved and their measurements	√	√	√	√			√		√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Q04. Describe the parameters effecting tool forces	√	√	√		√	√	√	√		√		√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Q05. Describe the theory/methods to find tool life.	√	√	√		√	√	√	√		√			understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

**TIME-210 COMPUTER AIDED DESIGN & MANUFACTURING**

Q01 Understand the basic fundamentals of computer aided design and manufacturing	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Q02 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
Q03 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

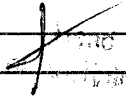
  
 Head  
 Department of Mechanical Engineering  
 L.K. Gujral Punjab Technical University  
 (Main Campus) Jalandhar

	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5 To learn the overall configuration and elements of computer integrated manufacturing systems.	✓	✓		✓		✓	✓	✓	✓	✓	✓		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

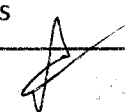
**TIME – 211 MAINTENANCE AND RELIABILITY ENGINEERING**

O1. Understand the concepts of Maintenance, Reliability and Availability	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O2. Establish maintenance strategies according to system characteristics and design transition programs to implement these strategies	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O3. Develop fault trees for system and apply various reliability models on fault analysis	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O4. Develop hazard rate models to know the behaviour of components.		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
O5. Manage the manufacturing organisation with highest possible availability.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

**TIME – 212 SUPPLY CHAIN MANAGEMENT**

  
 Dr. ...  
 ... Engineering  
 ... Technical University  
 ...

<p>Q01 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.</p>	✓		✓		✓	✓	✓	✓	✓		✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<p>Q02 Apply various techniques of inventory management and their practical situations.</p>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<p>Q03 Analyze how supply chain decisions related to facility location can be applied to various industries and designing the supply chain</p>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<p>Q04 How various warehousing management system and transportation can be practiced in various industries?</p>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<p>Q05 How supply chain performance can be measured using various models?</p>	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

  
 Date: \_\_\_\_\_  
 Page: \_\_\_\_\_



**TIME-213 PRODUCTION PLANNING AND CONTROL**

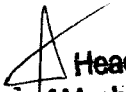
<p>O1: Forecast the appropriate requirement of resources for various production processes and other shop floor activities.</p>	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<p>O2: Design an appropriate strategy for resource planning through appropriate MRP tool</p>	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<p>O3: Improve the productivity of shop floor through design of appropriate production systems such as mass production, batch production etc. within existing conditions.</p>	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<p>O4: Apply scientific tools such as MRP, JIT optimizing production systems.</p>	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

**TIME – 214 PRODUCT DESIGN AND DEVELOPMENT**

<p>O1. Learn the importance of product design in industry and principal requirements of good product design.</p>	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
--	---	---	---	---	---	---	---	---	---	---	---	---	---	---------------------------------------	-----	---

02. Learn the knowledge about the ergonomic factor product design and product design methodology and techniques.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
03. Learn the knowledge about the basic elements and concepts of visual design	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
04. Learn the importance product graphics, product development and packaging of materials	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
05. Learn how the product design helps in to reduce the time to launch product in market	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<b>TME-215 ENTREPRENEURSHIP</b>																
01 Gain knowledge of discovering opportunities and basic entrepreneurial issues	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
02 Develop critical thinking skills on developing career as entrepreneurs and define the concept of entrepreneurship.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

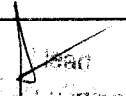
To inculcate the skill among the students for analyzing and improving existing methods of working in the shop floor of an organization	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
To impart through knowledge and skills to students with respect to allowances, rating, calculation of basic and standard time for manual operations in an organization	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
<b>ITME-217 METROLOGY AND INDUSTRIAL AUTOMATION</b>																
Study the characteristics and specification of instruments		√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Understand the sensors and transducers used in manufacturing industries like displacement, velocity, acceleration, force, torque and load		√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

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


CO3 Understand strategic decisions that entrepreneurs need to make and the ability to engage in strategic planning.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO4 Develop the ability to solve real life entrepreneurship issue and small/ Medium Business problems	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO4 Develop the ability to solve real life entrepreneurship issue and small/ Medium Business problems	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

**ETME-216 WORK SYSTEM DESIGN AND ERGONOMICS**

To provide basic understanding to the students about the concept and significance of work study and ergonomics.	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
To impart thorough knowledge to the students about various techniques of work-study for improving the productivity of an organization	√	√	√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

  
 Head  
 Department of Mechanical Engineering  
 Sri Jayachamarajendra Technical University  
 Mysore, Karnataka

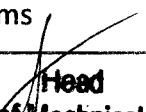
CO4: To apply suitable boundary conditions to a global equation for bars, plates, shells, beams, circular shafts, heat transfer, fluid flow, axi-symmetric and dynamic problems and solve them for displacements, stress and strains induced.	√	√	√	√	√	√	√	√	√	√	√	√	understanding, applying and designing	yes	Minor exam, Business Quiz, assignments, End term Exams
<b>TME-219 LOW COST AUTOMATION</b>															
CO1 Understand the types of automation and its various elements.	√	√	√	√	√	√	√	√	√	√	√	√	understanding, applying and designing	yes	Minor exam, Business Quiz, assignments, End term Exams
CO2 Select various components for low-cost automation systems.	√	√	√	√	√	√	√	√	√	√	√	√	understanding, applying and designing	yes	Minor exam, Business Quiz, assignments, End term Exams
CO3 Do some assembly automation	√	√	√	√	√	√	√	√	√	√	√	√	understanding, applying and designing	yes	Minor exam, Business Quiz, assignments, End term Exams

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

Grasp the world class industrial safety aspect familiar with various automation technologies in manufacturing and process industries.			√	√	√	√	√	√	√	√	√	√	√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Understand various automation tools and methods in manufacturing industry	√	√	√		√	√	√	√		√				understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
Implement various control and automation method in process industries.	√	√	√		√	√	√	√		√			√	understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

**ITME-218 FINITE ELEMENT ANALYSIS**

CO1: To explain the concepts behind formulation methods in FEM.	√	√	√		√	√	√	√		√				understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO2: To identify the application and characteristics of FEA elements such as bars, beams, plane and iso-parametric elements.	√	√	√		√	√	√	√		√	√	√		understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams
CO3: To develop element characteristic equation and generation of global equation.	√	√		√	√	√	√		√	√	√			understanding ,applying and designing	yes	Minor exam,Business Quiz,assignments,End term Exams

  
**Head**  
**Department of Mechanical Engineering**  
**LK. Gujral Punjab Technical University**  
**(Main Campus) Kapurthala**

**Research Methodology (Phd. Course Work)**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Formulate a research problem	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	Understand	Yes	Minor Exams, Assignments, End Term Exams
CO 2: Explain the different experimental designs and their analysis.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Understand	Yes	Minor Exams, Assignments, End Term Exams
CO 3: Apply different statistical tools for the research analysis	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Applying and Designing	Yes	Minor Exams, Assignments, End Term Exams
CO 4: Apply the research ethics	✓		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Applying and Designing	Yes	Assignments, Presentations and 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 Measure Attainment of CO
CO1: Understand the need of Non Conventional Machining Processes and able to Classify various processes.	✓	✓	✓		✓		✓	✓	✓	✓		✓	Understand	Yes	Minor Exams, Assignments, End Term Exams
CO2: Recognize the role of mechanical energy in non-Conventional machining processes.		✓		✓			✓	✓	✓			✓	Understand	Yes	Minor Exams, Assignments, End 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, End Term Exams
CO4: Understand the concept of machining the hard material using chemical energy and electrochemical energy.		✓	✓				✓	✓	✓	✓		✓	Applying and Designing	Yes	Assignments, Presentations and 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, End Term Exams

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

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

CO6: Familiarity and application of various thermal energy based non-conventional machining processes.	√		√	√	√	√	√	√	√	√	√	√	√	Applying and Designing	Yes	Minor Exams, Assignments, End Term Exams
--	---	--	---	---	---	---	---	---	---	---	---	---	---	------------------------	-----	--

**PhD Paper Presentation/Seminar**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Deal with nerves and think more positively about public speaking.	√	√	√		√	√	√	√	√	√	√	√	Thinking	Yes	Field based assignments, Report making, presentations etc.
CO 2: Consider ways of grabbing the listener's attention, holding their interest, and concluding strongly.	√		√			√	√	√	√	√	√	√	Thinking	Yes	Field based assignments, Report making, presentations etc.
CO3: Use body language and tone of voice to enhance their presentations.			√		√	√	√	√	√	√	√	√	Applying	Yes	Field based assignments, Report making, presentations etc.
CO4: Use slides and visual aids effectively.	√	√	√		√	√	√	√	√	√	√	√	Applying	Yes	Field based assignments, Report making, presentations etc.
CO5: Deliver an enthusiastic and well-practised presentation.	√	√	√		√	√	√	√	√	√	√	√	Applying	Yes	Field based assignments, Report making, presentations etc.

**Advanced Heat Transfer**

Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand the principles of heat transfer through conduction, convection and radiation modes.	√	√	√		√	√	√		√	√	√	√	Thinking	Yes	Field based assignments, Report making, presentations etc.
CO2: Understand the heat transfer during phase-change processes, such as boiling and condensation.	√	√	√			√		√	√	√	√	√	Thinking	Yes	Field based assignments, Report making, presentations etc.
CO3: Understand the practical aspects of the theories of heat transfer, such as design of heat exchangers.	√		√		√	√	√	√	√		√	√	Applying	Yes	Field based assignments, Report making, presentations etc.
CO4: Understand the concept related to mass transfer and its connection with heat transfer.		√	√		√	√	√	√		√	√	√	Applying	Yes	Field based assignments, Report making, presentations etc.

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



CO5: Carry out laboratory tests verifying the various principles of heat transfer.		√	√		√	√	√	√	√	√	√	√	√	Applyin_	Yes	Field based assignments, Report 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 Measure Attainment of CO
CO1: Understand the concept of computational fluid dynamics, modeling and simulation.	√	√	√		√	√	√		√		√	√	Understanding	Yes	Field based assignments, Report making, presentations etc.
CO2: Learn about the different governing equations of fluid dynamics.	√		√					√	√	√	√	√	Thinking	Yes	Field based assignments, Report making, presentations etc.
CO3: Understand the concept of parabolic, elliptic and hyperbolic equations and various methods of finite differencing and stability.		√	√		√	√	√	√	√		√	√	Applying	Yes	Field based assignments, Report making, presentations etc.
CO4: Understand the concept of turbulence, error and uncertainty & different turbulent	√	√	√		√	√	√		√	√			Applying	Yes	Field based assignments, Report 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 Measure Attainment of CO
CO1: To obtain an understanding of the fundamental theory of the FEA method;	√		√	√	√	√	√		√	√	√	√	Thinking	Yes	Field based assignments, Report 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, Report 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, Report making, presentations etc.

CO4: To understand the application and use of the FE method for heat transfer problems	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Understanding	Yes	Field based assignments, Report 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, Report 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 Measure Attainment of CO
CO1: Describe the concept, need and applications of composite materials.			✓	✓	✓	✓	✓		✓	✓	✓	✓	Thinking	Yes	Field based assignments, Report making, presentations etc.
CO 2: Solve the problem of effects of influencing factors on the strength of composite materials	✓		✓			✓		✓	✓	✓	✓	✓	Designing	Yes	Field based assignments, Report making, presentations etc.
CO3: Demonstrate the various manufacturing processes of the Metal/ceramic/polymer-based composites.	✓	✓	✓	✓	✓	✓	✓	✓	✓		✓	✓	Applying	Yes	Field based assignments, Report making, presentations etc.
CO 4: Test and characterize the composite and suggest secondary processing as per application.	✓	✓	✓		✓	✓	✓	✓		✓	✓	✓	Understanding	Yes	Field based assignments, Report 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 Measure 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, Report making, presentations etc.
CO2: Ability to go in research by applying optimization techniques in problems of Engineering and Technology		✓	✓			✓		✓	✓	✓	✓	✓	Designing	Yes	Field based assignments, Report making, presentations etc.

CO3: Ability to solve the mathematical results and numerical techniques of optimization theory to concrete Engineering problems by using computer software.	√	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Field based assignments, Report 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 Measure 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, Report 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, Report 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, Report 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, Report 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 Measure Attainment of CO
CO1: Recognize the need and measurement of vibration in mechanical systems	√		√	√		√	√		√	√	√	√	Understand	Yes	Field based assignments, Report making, presentations etc.
CO2: Suggest suitable methods of vibration reduction and absorption	√	√	√			√		√	√	√	√	√	Understand	Yes	Field based assignments, Report making, presentations etc.

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

<b>Tribology</b>															
Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Be able to know the field of tribology.	✓	✓	✓	✓	✓	✓			✓	✓	✓	✓	Understand	Yes	Field based assignments, Report making, presentations etc.
CO2: Be able to know the surface, properties of surface and related instruments	✓	✓	✓		✓	✓		✓	✓	✓	✓	✓	Understand	Yes	Field based assignments, Report 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, Report 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, Report making, presentations etc.

<b>Thermo Economics and Power Plants</b>															
Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO
CO1: Understand 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.

**Head**  
 Department of Mechanical Engineering  
 LK. Gujral Punjab Technical University  
 (Main Campus) Jalandhar

  
 Department of Mechanical Engineering  
 LK. PTU, Main Campus  
 Jalandhar

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, Report making, presentations etc.
CO4: Apply the knowledge in calculating the Power Load Calculations and Distribution.	√	√	√	√		√	√	√		√	√	√		Applying	Yes	Field based assignments, Report 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 Measure Attainment of CO
CO1: Describe the various laws of thermodynamics and their applications	√	√		√	√	√	√		√	√	√	√	Understand	Yes	Field based assignments, Report making, presentations etc.
CO 2: Explain the concepts of availability and irreversibility with respect to reacting and nonreacting systems.					√	√			√	√	√	√	Understand	Yes	Field based assignments, Report 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, Report making, presentations etc.
CO 4: Explain the behaviour of gases and chemical equilibrium.	√	√		√		√	√			√	√	√	Applying	Yes	Field based assignments, Report 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 Measure Attainment of CO
CO1: Deal with nerves and think more positively about public speaking.		√	√	√	√	√	√		√	√	√	√	Thinking	Yes	Field based assignments, Report making, presentations etc.
CO 2: Consider ways of grabbing the listener's attention, holding their interest, and concluding strongly.	√				√	√			√	√	√	√	Thinking	Yes	Field based assignments, Report making, presentations etc.
CO3: Use body language and tone of voice to enhance their presentations.	√	√	√	√	√	√			√		√	√	Applying	Yes	Field based assignments, Report making, presentations etc.

Department of Mechanical Engineering  
 I.K. Gujral Punjab Technical University  
 (Main Campus) Jalandhar  
 Department of Mechanical Engineering  
 I.K.G. P.T. Jalandhar

CO4: Use slides and visual aids effectively.	√	√	√	√	√	√	√	√	√	√	√	√	√	√	√	Applying	Yes	Field based assignments, Report 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 Measure Attainment of CO
CO1: Understand the various Conventional and Non-Conventional machining processes	√		√	√	√		√		√	√	√	√	Understand	Yes	Field based assignments, Report making, presentations etc.
CO2: Learn about measuring equipment, error types and their evaluation	√	√	√	√	√				√	√	√	√	Understand	Yes	Field based assignments, Report making, presentations etc.
CO3: Learn about process capability and six sigma		√	√	√	√				√		√	√	Applying and Designing	Yes	Field based assignments, Report making, presentations etc.
CO4: Learn about quality control and quality assurance systems	√	√	√	√			√			√	√	√	Applying	Yes	Field based assignments, Report 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 Measure Attainment of CO
CO1: Understand concepts of stress and strain in solids and associated theories of failure.	√		√	√	√		√		√	√	√	√	Understand	Yes	Field based assignments, Report making, presentations etc.
CO2: Derive governing equations to solve engineering problem.	√	√			√				√	√	√	√	Understand	Yes	Field based assignments, Report 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, Report making, presentations etc.
CO4: Analyze deformations in beam and locate shear centre in thin-walled beams.	√	√	√	√			√			√	√	√	Applying	Yes	Field based assignments, Report making, presentations etc.

**Mechatronics**

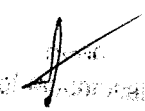
Course Outcome	PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	Skill	Focus on Employability / Entrepreneurship	Assessment Tools to Measure Attainment of CO

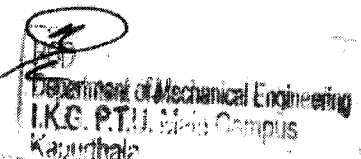
Department of Mechanical Engineering  
 I.K.G.P.T. Kanurthai  
 (Main Campus)

CO1: Each individual should develop competence in technologies of automation.	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Thinking	Yes	Field based assignments, Report making, presentations etc.	
CO2: Capable to develop simple control systems and study the system response.	✓	✓			✓			✓	✓	✓	✓	✓	Thinking	Yes	Field based assignments, Report making, presentations etc.	
CO3: Individual should be able to understand the communication system in automation		✓	✓	✓	✓							✓	✓	Applying	Yes	Field based assignments, Report making, presentations etc.
CO4: Analyze deformations in beam and locate shear centre in thin-walled beams.	✓		✓	✓			✓	✓	✓	✓	✓	✓	✓	Applying	Yes	Field based assignments, Report 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 Measure Attainment of CO
CO1: To introduce the objects of product design and requirements of a good product design.		✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	✓	Understand	Yes	Field based assignments, Report 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, Report 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, Report making, presentations etc.

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

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