SCHEME OF STUDIES & EXAMINATION
B.TECH. 2nd year Mechanical Engg. Semester-III

Course No	Course Title	Teaching Schedule				Marks for Class Work	Marks for Exam		Total Marks
		L	T	P	TOTAL		THEORY	PRACTICAL	
HUM-201 E/ MATH-201E	Basics of Industrial Sociology, Economics & Management / Mathematics-III	3	1	-	4	50	100	-	150
ME-201 E	Thermodynamics	3	1	-	4	50	100	-	150
ME-203 E	Strength of Materials-I	3	1	-	4	50	100	-	150
ME-205 E	Machine Drawing	2	-	4	6	50	100	-	150
ME-207 E	Kinematics of Machine	3	1	-	4	50	100	-	150
ME-209E	Production Technology-I	3	1	-	4	50	100	-	150
ME-211 E	Kinematics of Machine Lab	-	-	3	3	50	-	50	100
ME-213 E	Thermodynamics Lab	-	-	3	3	50		25	75
ME-215 E	Strength of Materials Lab	-	-	3	3	50	-	25	75
	TOTAL	17	5	13	35	450	600	100	1150

Note: Students will be allowed to use Non-Programmable scientific calculator. However, sharing of calculator will not be permitted.

Duration of theory as well as practical exams time is three hrs for all courses except ME-205 E for which it is 4 hrs.

Course Contents of HUM-201 E to be provided by Humanities Group.

SCHEME OF STUDIES & EXAMINATIONS
B.TECH. 2nd YEAR (SEMESTER – IV) MECHANICAL ENGINEERING (2004-2005)

Course No.	Course Title	Teaching Schedule				Marks for Class work	Marks for Examination		Total Marks
		L	T	P	Total		Theory	Practical	
HUM-201 E/ MATH-201E	Basics of Industrial Sociology, Economics & Management / Mathematics-III	3	1	-	4	50	100	-	150
ME-202 E	Production technology-II	3	1	-	4	50	100	-	150
ME-204 E	Material Science	4	-	-	4	50	100	-	150
ME-206 E	Strength of Materials – II	3	1	-	4	50	100	-	150
ME-208 E	Fluid Mechanics	3	1	-	4	50	100	-	150
ME-210 E	Dynamics of Machine	3	1	-	4	50	100	-	150
ME-212 E	Production technology lab	-	-	4	4	50	-	50	100
ME-214 E	Fluid Mechanics Lab	-	-	3	3	25	-	25	50
ME-216 E	Dynamics of machine lab	-	-	3	3	25	-	25	50
	TOTAL	19	5	10	34	400	600	100	1100

Note:

1. **Practical training of 4 weeks duration during summer vacations and its evaluation in 5th Semester.**
2. **Students will be allowed to use Non-Programmable Scientific Calculator. However, Sharing of calculator will not be permitted.**

Scheme of Examination
B.Tech 5th Sem (Mechanical Engineering)

S.No	Subjects Name	Code	Teaching Schedule (Hrs)				Examination Schedule (Marks)			Total Marks	Duration of Exam (Hrs)
			L	T	P/D	Total	Sessional	Theory	Practical/viva-voce		
1	I.C. Engine & Gas Turbine	ME 301 E	3	1	----	4	50	100	----	150	3
2	Fluid Machines	ME 303 E	3	1	----	4	50	100	----	150	3
3	Heat Transfer	ME 305 E	3	1	----	4	50	100	----	150	3
4	Industrial Engineering	ME 307 E	3	1	----	4	50	100	----	150	3
5	Machine Design – 1	ME 309 E	2	----	5	7	50	100	----	150	3
6	Steam Generation & Power	ME 311 E	3	1	----	4	25	100	----	125	3
7	Thermal Engineering (PR)	ME 313 E	----	----	2	2	25	----	25	50	3
8	Fluid Machines (PR)	ME 315 E	----	----	2	2	25	----	25	50	3
9	Heat Transfer (PR)	ME 317 E	----	----	2	2	25	----	25	50	3
10	Industrial Engineering	ME 319 E	----	----	2	2	25	----	25	50	3
11	Machine Design – I (Viva-voce)	ME 321 E	----	----	----	----	-----	----	25	25	3
12	Vocational Training	ME 323 E	----	----	----	----	50	----	-----	50	----
	Total		**17**	**5**	**13**	**35**	**425**	**600**	**125**	**1150**	

Note: Students will be allowed to use Non-Programmable scientific calculator. However, sharing of calculator will not be permitted. Duration of theory as well as practical exams time is three hrs for all courses.

Scheme of Examination
B.Tech 6th Sem (Mechanical Engineering)

S.No	Subjects Name	Code	Teaching Schedule (Hrs)				Examination Schedule (Marks)			Total Marks	Duration of Exam (Hrs)
			L	T	P/D	Total	Sessional	Theory	Practical/viva-voce		
1	Refrigeration and air conditioning	ME 302 E	3	1	---	4	50	100	---	150	3
2	Tribology	ME 304 E	3	1	---	4	50	100	---	150	3
3	Mechanical vibration	ME 306 E	3	1	---	4	50	100	---	150	3
4	Principles of management	HUM 311 E	3	1	---	4	50	100	---	150	3
5	Computer aided design and manufacturing	ME 308 E	4	1	---	5	50	100	---	150	3
6	Machine design-II	ME 310 E	2	--	6	8	50	100	---	150	4
7	Refrigeration and air conditioning lab	ME 312 E	---	---	2	2	25	---	25	50	3
8	Tribology and Mechanical vibration lab	ME 314 E	---	---	2	2	50	---	25	75	3
9	Computer aided design and manufacturing lab	ME 316 E	---	---	2	2	50	---	25	75	3
10	Machine design-II (viva –voce)	ME 318 E	---	---	---	---	---	---	50	50	3
Total			**18**	**5**	**12**	**35**	**425**	**600**	**125**	**1150**	

Note: Students will be allowed to use Non-Programmable scientific calculator. However, sharing of calculator will not be permitted. Duration of theory as well as practical exams time is three hrs for all courses.

Course Contents of HUM 311 E to be provided by Humanities Group.

B.Tech. (Third semester) Mechanical engineering

BASICS OF INDUSTRIAL SOCIOLOGY, ECONOMICS & MANAGEMENT

HUM – 201 E			Sessional	:	50
L	T	P	Theory	:	100
3	1	-	Total	:	150
			Duration of Exam.	:	3 Hrs.

UNIT-I

Meaning of social change, nature of social change, theories of social change. The direction of social change, the causes of social change, the process of social change. Factors of social change – the technological factors, the cultural factors, effects of technology on major social institutions, social need of status system, social relations in industry.

UNIT-II

Meaning of Industrial Economic, Production Function, its types, Least Cost Combination, Law of Variable Proportion, Laws of Return – Increasing, Constant & Diminishing.

Fixed & variable costs in short run & long run, opportunity costs, relation between AC & MC, U-shaped short run AC Curve.

Price & Output Determination under Monopoly in short run & long run. Price Discrimination, Price Determination under Discriminating Monopoly. Comparison between Monopoly & Perfect Competition.

UNIT – III

Meaning of Management, Characteristics of Management, Management Vs. Administration, Management – Art, Science & Profession, Fayol's Principles of Management.

Personnel Management – Meaning & Functions, Manpower – Process of Manpower Planning, Recruitment & Selection – Selection Procedure.

Training – Objectives & Types of Training, Various Methods of Training. Labour Legislation in India – Main provisions of Industrial disputes Act 1947;

UNIT – IV

Marketing Management – Definition & Meaning, Scope of Marketing Management, Marketing Research – Meaning, Objectives.

Purchasing Management – Meaning & Objectives, Purchase Procedure, Inventory Control Techniques.

Financial Management – Introduction, Objectives of Financial decisions, Sources of Finance.

Note : Eight questions are to be set taking two from each unit. The students are required to attempt five questions in all, taking at least one from each unit.

TEXT BOOKS :

1. "Modern Economic Theory" Dewett, K.K., S. Chand & Co.
2. "Economic Analysis" K.P. Sundharam & E.N. Sundharam (Sultan Chand & Sons).
3. "Micro Economic Theory" M.L. Jhingan (Konark Publishers Pvt. Ltd.).
4. "Principles of Economics" M.L. Seth (Lakshmi Narain Aggarwal Educational Publishers – Agra).
5. "An Introduction to Sociology", D.R. Sachdeva & Vidya Bhusan.
6. "Society – An Introductory Analysis", R.M. Maclver Charles H. Page.
7. "Principles and Practices of Management : R.S. Gupta; B.D. Sharma; N.S. Bhalla; Kalyani.

REFERENCE BOOKS

1. "Organization and Management : R.D. Aggarwal, Tata McGraw Hill.
2. Business Organization and Management : M.C. Shukla

MATH-201 E **MATHEMATICS - III**

L	T	P
3	1	-

Theory	:	100
Sessional	:	50
Total	:	150
Duration of Exam		: 3 Hrs.

UNIT – I

Fourier Series : Euler's Formulae, Conditions for Fourier expansions, Fourier expansion of functions having points of discontinuity, change of interval, Odd & even functions, Half-range series.

Fourier Transforms : Fourier integrals, Fourier transforms, Fourier cosine and sine transforms. Properties of Fourier transforms, Convolution theorem, Perseval's identity, Relation between Fourier and Laplace transforms, Fourier transforms of the derivatives of a function, Application to boundary value problems.

UNIT-II

Functions of a Complex Variables : Functions of a complex variable, Exponential function, Trigonometric, Hyperbolic and Logarithmic functions, limit and continuity of a function, Differentiability and analyticity.

Cauchy-Riemann equations, Necessary and sufficient conditions for a function to be analytic, Polar form of the Cauchy-Riemann equations, Harmonic functions, Application to flow problems, Conformal transformation, Standard transformations (Translation, Magnification & rotation, inversion & reflection, Bilinear).

UNIT-III

Probability Distributions : Probability, Baye's theorem, Discrete & Continuous probability distributions, Moment generating function, Probability generating function, Properties and applications of Binomial, Poisson and normal distributions.

UNIT-IV

Linear Programming : Linear programming problems formulation, Solution of Linear Programming Problem using Graphical method, Simplex Method, Dual-Simplex Method.

Text Book

1. Higher Engg. Mathematics : B.S. Grewal
2. Advanced Engg. Mathematics : E. Kreyzig

Reference Book

1. Complex variables and Applications : R.V. Churchil; Mc. Graw Hill
2. Engg. Mathematics Vol. II: S.S. Sastry; Prentice Hall of India.
3. Operation Research : H.A. Taha
4. Probability and statistics for Engineer : Johnson. PHI.

Note : Examiner will set eight question, taking two from each unit. Students will be required to attempt five questions taking at least one from each unit.

ME- 201 E THERMODYNAMICS

L	T	P
3	1	-

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam. : 3 hrs.

Unit I

Basic Concepts: Thermodynamics: Macroscopic and Microscopic Approach, Thermodynamic Systems, Surrounding and Boundary, Thermodynamic Property – Intensive and Extensive, Thermodynamic Equilibrium, State, Path, Process and Cycle, Quasistatic, Reversible and Irreversible Processes, Working Substance. Concept of Thermodynamic Work and Heat, Equality of Temperature, Zeroth Law of Thermodynamic and its utility.

Ideal and Real Gases: Concept of an Ideal Gas, Basic Gas Laws, Characteristic Gas Equation, Avagadro's law and Universal Gas Constant, P-V-T surface of an Ideal Gas. Vander Waal's Equation of state, Reduced Co-ordinates, Compressibility factor and law of corresponding states. Mixture of Gases, Bass, Mole and Volume Fraction, Gibson Dalton's law, Gas Constant and Specific Heats, Entropy for a mixture of Gases.

Unit II

First Law of Thermodynamics: Energy and its Forms, Energy and 1st law of Thermodynamics, Internal Energy and Enthalpy, 1st Law Applied to Non-Flow Process, Steady Flow Process and Transient Flow Process, Throttling Process and Free Expansion Process.

Second Law Of Thermodynamics: Limitations of First Law, Thermal Reservoir Heat Source and Heat Sink, Heat Engine, Refrigerator and Heat Pump, Kelvin- Planck and Clausius Statements and Their Equivalence, Perpetual Motion Machine of Second Kind. Carnot Cycle, Carnot Heat Engine and Carnot Heat Pump, Carnot's Theorem and its Corollaries, Thermodynamic Temperature Scale.

Unit III

Entropy: Clausius Inequality and Entropy, Principle of Entropy Increase, Temperature Entropy Plot, Entropy Change in Different Processes, Introduction to Third Law of Thermodynamics.

Availability, Irreversibility and Equilibrium: High and Low Grade Energy, Availability and Unavailable Energy, Loss of Available Energy Due to Heat Transfer Through a Finite Temperature Difference, Availability of a Non-Flow or Closed System, Availability of a Steady Flow System, Helmholtz and Gibb's Functions, Effectiveness and Irreversibility.

Unit IV

Pure Substance: Pure Substance and its Properties, Phase and Phase Transformation, Vaporization, Evaporation and Boiling , Saturated and Superheat Steam, Solid – Liquid – Vapour Equilibrium, T-V, P-V and P-T Plots During Steam Formation, Properties of Dry, Wet and Superheated Steam, Property Changes During Steam Processes, Temperature – Entropy (T-S) and Enthalpy – Entropy (H-S) Diagrams, Throttling and Measurement of Dryness Fraction of Steam.

Thermodynamic Relations: T-Ds Relations, Enthalpy and Internal Energy as a Function of Independent Variables, Specific Heat Capacity Relations, Clapeyron Equation, Maxwell Relations.

Text Books:

1. Engineering Thermodynamics – C P Arora, Tata McGraw Hill
2. Engineering Thermodynamics – P K Nag, Tata McGraw Hill

Reference Books :

1. Thermal Science and Engineering – D S Kumar, S K Kataria and Sons
2. Engineering Thermodynamics -Work and Heat tranfer – G F C Rogers and Maghew Y R Longman

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Third semester) Mechanical engineering

ME- 203 E STRENGTH OF MATERIALS –I

L	T	P		
3	1		Sessional	: 50 Marks
			Theory	: 100 Marks
			Total	: 150 Marks
			Duration of Exam.	: 3 Hrs.

Unit 1

Simple stresses & strains : Concept & types of Stresses and strains, Polson's ratio, stresses and strain in simple and compound bars under axial loading, stress strain diagrams, Hooks law, elastic constants & their relationships, temperature stress & strain in simple & compound bars under axial loading, Numerical.

Compound stresses & strains: Concept of surface and volumetric strains, two dimensional stress system, conjugate shear stress at a point on a plane, principle stresses & strains and principal- planes, Mohr's circle of stresses, Numerical.

Unit II

Shear Force & Bending Moments : Definitions, SF & BM diagrams for cantilevers, simply supported beams with or without over-hang and calculation of maximum BM & SF and the point of contraflexture under (i) concentrated loads, (ii) uniformly distributed loads over whole span or a part of it, (iii)combination of concentrated loads and uniformly distributed loads, (iv) uniformly varying loads and (v) application of moments, relation between the rate of loading, the shear force and the bending moments, Problems.

Torsion of circular Members : Torsion of thin circular tube, Solid and hollow circular shafts, tapered shaft, stepped shaft & composite circular shafts, combined bending and torsion, equivalent torque, effect of end thrust. Numericals.

Unit III

Bending & shear Stresses in Beams: Bending stresses in beams with derivation & application to beams of circular, rectangular, I,T and channel sections, composite beams, shear stresses in beams with derivation combined bending torsion & axial loading of beams. Numericals.

Columns & Struts: Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Eulers formulae for the elastic buckling load, Eulers, Rankine, Gordom's formulae Johnson's empirical formula for axial loading columns and their applications, eccentric compression of a short strut of rectangular & circular sections, Numerical.

Unit IV

Slope & Deflection : Relationship between bending moment, slope & deflection, Mohr's theorem, moment area method, method of integration, Macaulay's method, calculations for slope and deflection of (i) cantilevers and (ii) simply supported beams with or without overhang under concentrated load, Uniformly distributed loads or combination of concentrated and uniformly distributed loads, Numerical.

Fixed Beams: Deflections, reactions and fixing moments with SF & BM calculations & diagrams for fixed beams under (I) concentrated loads, (ii) uniformly distributed load and (iii) a combination of concentrated loads & uniformly distributed load.

Text Books:

1. Strength of Materials – G.H.Ryder - Third Edition in S I units 1969 Macmillan India
2. Strength of Materials – Andrew Pytel and Fredinand L.Singer Fourth Edition, Int. Student Ed. Addison – Wesley Longman

Reference Books :

1. Strength of Materials – Popov, PHI, New Delhi.
2. Strength of Materials – Sadhu Singh, Khanna Publications
3. Strength of Materials A Rudimentary Apprach – M.A. Jayaram, Revised Ed.2001, Sapna Book House, Bangalore
4. Strength of Materials – U.C.Jindal
5. Strength Materials – I. Kripal Singh

NOTE: In the semester examination, the examiner will set 8 questions in all, at least one question from each unit, and students will be required to attempt only 5 questions.

B.Tech. (Third semester) Mechanical engineering

ME- 205 E MACHINE DRAWING

L	T	P
2	-	4

Theory : 100 Marks
Sessional : 50 Marks
Total : 150 Marks
Duration of Exam : 4 hrs.

Unit I

Introduction to BIS Specification SP : 46 – 1988 Code of Engineering drawing – Limits, fits and Tolerance (Dimensional and Geometrical tolerance) , Surface finish representation.
Gear : Gear terminology, I.S. convention , representation of assembly of spur gears, helical gears, bevel gears , worm and worm wheel.

Unit II

Orthographic view from isometric views of machine parts / components. Dimensioning , Sectioning. Exercises on Coupling , Crankshaft , pulley , piston and Connecting rod , Cotter and Knuckle joint. Riveted Joint and Welded Joint.

Unit III

Assembly drawing with sectioning and bill of materials from given detail drawings of assemblies : Lathe Tail stock , machine vice , pedestal bearing , Steam stop valve , drill jigs and milling fixture.

NOTE :

(1) In the semester examination , the examiner will set two questions from each unit. The students have to attempt three questions taking one from each unit.

(2) The questions from Unit I and Unit II will carry 20 marks each. Question from Unit III will carry 60 marks.

Text Books:

1. Machine Drawing by N D Bhat and V M Panchal
   Charotar Publishing House

2. A Text Book of Machine Drawing : P S Gill
   Pub.: S K Kataria & Sons

Reference Books :

1. A Text Book of Machine Drawing : Laxmi narayana and Mathur
   Pub. : M/s. Jain Brothers, New Delhi.

2. Machine drawing : N Sidheshwar, P Kannaieh V V S Sastry
   Pub.: Tata Mc Graw –Hill Publishing Ltd.
   R B Gupta Satya Prakashan

Note : Some of the exercises may be done on AUTOCAD Software.

B.Tech. (Third semester) Mechanical engineering

ME 207 E KINEMATICS OF MACHINES

L	T	P		
3	1		Sessional	: 50 Marks
			Theory	: 100 Marks
			Total	: 150 Marks
			Duration of Exam.	: 3 Hrs.

UNIT I

Kinematics, introduction to analysis and synthesis of mechanisms, Kinematics' pairs, Degree of freedom, Dynamitic chain mechanism, Machine, Four-bar chain, inversions, Single and double slider crank chain, Quick return mechanisms, Introduction to function generation, Path generation and rigid bodied guidance.

Velocity determination; Relative velocity methods, Instantaneous center method Acceleration determination, Kennedy's Space cent rode and body cent rode,

UNIT II

Centripetal and tangential accelerations, Acceleration determination by graphical method using velocity polygons, Cariole's component of acceleration, Klein's and other constructions.
Analytical methods to find velocity and acceleration of four –link mechanism, slider crank mechanism, freumdenstein's equation, Coordinate a angular displacements of input and output links (Path generation function generation), Least square technique, Rigid body guidance.

UNIT III

Pantograph, straight-line motion mechanisms (Peculiar, Hart, Scott Russell, Grasshopper, Watt, Kemp's Tchybishev, Parallel linkages) Indicator mechanisms (Simplex Crosby , Thomson, etc) Automobile steering gears (Davis and Ackerman),Hooks joint (universal coupling), Double hooks joints.

Types of friction, Laws of dry friction, Motion along inclined plane Screw threads, Wedge, Pivots and collars, Plate and cone clutches, Antifriction bearings, friction circle and friction axis, bearings and lubrication. Motion along inclined plane and screws, Pivots and Collars Thrust Bearings lubrication

UNIT IV

Types of cams and followers, various motions of the follower, Construction of cam profiles, Analysis for velocities and accelerations of tangent and circular arc cams with roller and flat –faced followers.
Open and crossed belt drives, velocity ratio, slip , material for belts, crowning of pulleys, law of belting, types of pulleys, length of belts ratio of tensions, centrifugal tension, power transmitted by belts and ropes, initial tension, creep, chain drive, chain length, classification of chains

Suggested reading:

1. Theory of machines:
   S. S. Rattan, Tata McGraw Hill Publications.
2. Theory of Mechanism and Machines:
   Jagdish Lal, Metropolitan Book Co.
3. Mechanism synthesis and analysis:
   A.H. Soni, McGraw Hill Publications.
4. Mechanism:
   J.S. Beggs.
5. Mechanics of Machines:
   P.Black, Pergamon Press.
6. Theory of Machines:
   P.L.Ballaney, Khanna Publisher.

ME-209 E PRODUCTION TECHNOLOGY-1

L	T	P
3	1	-

Sessional : 50 Marks
Theory : 100 Marks
Total : 150Marks
Duration of Exam. : 3 Hrs.

UNIT I

Metal cutting & Tool life

Basic tool geometry, single point tool nomenclature, chips-various types and their characteristics, mechanism of chip formation, theoretical and experimental determination of shear angle, orthogonal and oblique metal cutting, metal cutting theories, relationship of velocities, forces and power consumption.

Effect of operating parameters life tool geometry, cutting speed, feed depth of out, coolant, materials etc on forces temp. tool life, surface finish etc., tool life relationship, tailor equation of tool life , tool material and mechanism.

UNIT II

Economics of metal machining & Multi edged tools

Element of machining cost, tooling economics, machines economics and optimization.

Broach tools-types materials and applications, geometry of twist drills, thrust torque and power calculation in drills, form tools-application.

UNIT III

Metal forming & Jigs and Fixtures

Metal blow condition, theories of plasticity conditions of plane strains, friction condition in metal working, wire drawing-extension of rods, theory of forging, roiling of metals and elementary rolling theory, no slip angle and forward slip.

Tool engineering, types of tools, usefulness, principles of lactation, locating and clamping devices, Jigs bushes, drilling Jigs, milling fixtures, turning fixtures, boring and broaching fixtures, different materials for Jigs and fixtures, economic of jigs and fixtures.

UNIT IV

Metrology

Measurements, linear and angular simple measuring instruments various clampers, screw gauge, sine bar, auto-collimator, comparator-mechanical, electrical, optical, surface finish and its measurement, micro and macro deviation, factors influencing surface finish and evaluation of surface finish.

Suggested reading:

1. Manufacturing science:
   Ghosh and Malik, E.W. Press
2. Principles of metal cutting:
   Sen and Bhattacharya, New Central Book.
3. Metal cutting principles:
   Shaw, MIT Press Cambridge
4. Manufacturing analysis:
   Cook, Adisson-Wesley
5. Modern machining processes:
   Pandey and Shan, Tata McGraw Hill Publications

B.Tech. (Third semester) Mechanical engineering

ME 211 E KINEMATICS OF MACHINES (PRACTICAL)

L	T	P
-	-	3

Class Work : 50 Marks
Exam : 50 Marks
Total : 100Marks
Duration of exam : 3 Hrs.

List of experiments

1. To determine the modulus of rigidity of the material of a closed coil helical spring and the stiffness of a spring
2. To determine the value of coefficient of friction for a given pair of surfaces using friction apparatus
3. To determine the modulus of rigidity of horizontal shaft
4. To determine experimentally the ratio of the cutting time to idle time (cutting stroke to idle stroke) of the crank and slotted lever (QRM)/ Whitworth and compare the result to theoretical values plot the following
   a. θ v/s X (displacement of slider).
   b. θ v/s velocity.
   c. θ v/s Acceleration and to compare the values of velocities
   (Take angles θ =45˚, 90˚, 135˚, 225˚, 270˚ &335˚, ω = 1 rad/s)
5. To determine the value of coefficient of friction between the screw and nut of the jack, while:
   a. Raising the load
   b. Lowering the load
6. To draw experimentally a curve of the follower-displacement v/s cam-angle. Differentiate the above curve to get velocity and acceleration plot and compare the values with those obtained analytically.
7. **To determine the coefficient of friction between belt and pulley and plot a graph between $\log_{10} T_1/T_2$ v/s, θ.**
8. To determine the displacement, velocities, & accelerations of the driven shaft of a Hooke's joint for a constant speed of the driver shaft.
9. To determine velocity & acceleration of slider in slider-crank mechanism and plot the following:
   a. **θ v/s x (displacement of slider)**
   b. θ v/s velocity and
   c. θ v/s acceleration.

Compare the values of velocities & acceleration with those obtained theoretically.(Assume ω=I rad/sec.).

10. Study of the inversions of the single slider crank mechanism.
11. To verify the law of moment using Bell- crank lever.

Note : Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

B.Tech. (Third semester) Mechanical engineering

ME-213 E THERMODYNAMICS (PRACTICAL)

L	T	P
-	-	3

Class Work	:	50 Marks
Exam	:	25 Marks
Total	:	75 Marks
Duration of exam	:	3 Hrs.

List of Experiments

1. Study of 2 stroke petrol and diesel engine models.
2. Study of 4-stroke petrol/diesel engine model.
3. Study of boilers.
4. Study of Babcock-Wilcox boiler (Model).
5. Study of locomotive boiler (Model).
6. Study of Lancashire boiler (Model).
7. To study the Red wood viscometer and measure the viscosity of fluid.
8. To measure the flash point of the given fuel
9. To study the Nestler's boiler.
10. To study various parts of the vertical steam engine.
11 To study the diesel engine and make a trial on it.

Note : Any 8 experiments from the above list and other 2 from others developed by institute) are required to be performed by students in the laboratory.

B.Tech. (Third semester) Mechanical engineering

ME- 215 E STRENGTH OF MATERIALS LAB

L	T	P
-	-	3

Class Work	:	50 Marks
Exam	:	25 Marks
Total	:	75 Marks
Duration of exam	:	3 Hrs.

List of Experiments :

1. To study the Brinell hardness testing machine & perform the Brinell hardness test.
2. To study the Rockwell hardness testing machine & perform the Rockwell hardness test.
3. To study the Vickers hardness testing machine & perform the Vickers hardness test.
4. To study the erichsen sheet metal testing machine & perform the erichsen sheet metal test.
5. To study the Impact testing machine and perform the Impact tests (Izod & Charpy).
6. To study the Universal testing machine and perform the tensile test.
7. To perform compression & bending tests on UTM.
8. To perform the sheer test on UTM.
9. To study the torsion testing machine and perform the torsion test.
10. To draw shear Force, Bending Moment Diagrams for a simply Supported Beam under Point and Distributed Loads.
11. To determine Mechanical Advantage and Efficiency of Single and Double Purchase Winch Crab.
12. To determine Mechanical Advantage and Efficiency of Worm and Worm Wheel.
13. To determine Mechanical Advantage, Efficiency of Simple and Compound Screw Jack.
14. To find Moment of Inertia of a Fly Wheel.

Note: Any 8 experiments from the above list and other 2 from others (developed by institute) are required to be performed by students in the laboratory.

B.Tech. (Fourth semester) Mechanical engineering

ME-202 E PRODUCTION TECHNOLOGY

L	T	P
3	1	-

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam : 3 Hrs

UNIT I

Kinematics of Machine Tools.

Drives in machine tools for rotation movement, stepped and step less drives, mechanical and hydraulic drives, Individual and group drives, selection of extreme values of spindle speed on a lathe, principle of stepped regulation, Layout of spindle speeds. A.P., G.P. and Logarithmic progressions, Kinematics advantage of G. P. for gear box design, selection of common ratio, Number of steps in a given speed range, design of all geared head stock.

UNIT II

Manufacturing Methods

Characteristics of turret Lathes, turret-indexing mechanism, tooling equipment for turrets, tool Layout or turrets. Classification of gear production methods, gear generation, gear hobbling gear shaping, gear finishing methods; shaving, burnishing grinding, Lapping gear shaping, gear finishing methods; shaving, burnishing grinding, honing.

UNIT III

Unconventional Machining Processes & Press Working Tools

Need for unconventional processes, Ultrasonic machining, electrochemical machining, electrochemical grinding, Laser beam machining their process parameters, principle of metal removal, applications advantages and limitations.

Introduction, classifications of presses and dies, hear, action in die cutting operations, center of pressure, mathematical calculation of center of pressure, clearances, cutting forces, punch dimensioning.

UNIT IV

Machine Tools Vibration and Dynamometry

Introduction, effects of vibration no-machine tools, cutting conditions, work piece and tools life, source of vibration, machine tool chatter, Need for measuring forces, basic requirements of measuring techniques, design requirements of dynamometers, 3-divisional turning dynamometer and its calibration, drill dynamometers.

Suggested reading:

1. Manufacturing science:
   Ghosh and Malik, E.W. Press
2. Principles of metal cutting:
   Sen and Bhattacharya, New Central Book.
3. Metal cutting principles:
   Shaw, MIT Press Cambridge
4. Manufacturing analysis:

Cook, Adisson-Wesley

5. Modern machining processes:

Pandey and Shan, Tata McGraw Hill Publications

Note: In the semester examination, the examiner will set 8 questions, at least Two question from each unit, and students will be required to attempt only 5 questions one from each unit.

B.Tech. (Fourth semester) Mechanical engineering
ME- 204 E MATERIAL SCIENCE

L	T	P
4	-	-

Sessional	: 50 Marks
Theory	: 100 Marks
Total	: 150 Marks
Duration of Exam	: 3 Hrs

Unit I

Crystallography: Review of crystal structure, space lattice, crystal planes and crystal directions, co-ordination number, number of atoms per unit cell, atomic packing factor, Numericals related to crystallograpImperfection in metal crystals: Crystal imperfections and their classifications, point defects, line defects, edge & screw dislocations, surface defects, volume defects & effects of imperfections on metal properties.

Unit II

Solid solutions and phase diagram: Introduction to single and multiphase solid solutions and types of solid solutions, importance and objectives of phase diagram, systems, phase and structural constituents, cooling curves, unary & binary phase diagrams, Gibbs's phase rule, Lever rule, eutectic and eutectoid systems, peritectic and peritectoid systems, iron carbon equilibrium diagram and TTT diagram. Heat Treatment: Principles, purpose, classification of heat treatment processes, annealing, normalizing, stress relieving, hardening, tempering, carburizing, nitriding, cyaniding, flame and induction hardening. Allotropic transformation of iron and steel, Properties of austenite, ferrite, pearlite, martensite.

UNIT III

Deformation of Metal: Elastic and plastic deformation, mechanism of plastic deformation, twinning, conventional and true stress strain curves for polycrystalline materials, yield point phenomena, strain ageing, work hardening, Bauschinger effect, season cracking. Recovery, re-crystallization and grain growth. Failures of metals: Failure analysis, fracture, process of fracture, types of fracture, fatigue, characteristics of fatigue, fatigue limit, mechanism of fatigue, factors affecting fatigue.

UNIT IV

Creep & Corrosion: Definition and concept, creep curve, mechanism of creep, impact of time and temperature on creep, creep fracture, creep testing and prevention against creep. Corrosion: Mechanism and effect of corrosion, prevention of corrosion. Plastic, Composite and Ceramics: Polymers, formation of polymers, polymer structure and crystallinity, polymers to plastics types, reinforced particles-strengthened and dispersion strengthened composites. Ceramic materials: Types of ceramics, properties of ceramic, ceramic forming techniques, mechanical behavior of ceramic.

Text Books:

1. Elements of Material Science and Engineering: VanVlack, Wesley Pub. Comp.
2. Material Science - Narula, Narula and Gupta. New Age Publishers

Reference Books:

1.Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi
2. A Text Book of Material Science & Metallurgy – O.P. Khanna, Dhanpat Rai & Sons
3. Material Science and Engineering-An Introduction - Callister; W.D., John Wiley & Sons., Delhi.
4. Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi

Note: In the semester examination, the examiner will set 8 questions, at least Two question from each unit, and students will be required to attempt only 5 questions one from each unit.

B.Tech. (Fourth semester) Mechanical engineering
ME- 206 E STRENGTH OF MATERIALS-II

L	T	P
3	1	-

Sessional : 50Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam: 3Hrs.

Unit I

Strain Energy & Impact Loading: Definitions, expressions for strain energy stored in a body when load is applied (i) gradually, (ii) suddenly and (iii) with impact, strain energy of beams in bending, beam deflections, strain energy of shafts in twisting, energy methods in determining spring deflection, Castigliano's & Maxwell's theorems, Numerical. Theories of Elastic Failure: Various theories of elastic failures with derivations and graphical representations, applications to problems of 2- dimensional stress system with (i) Combined direct loading and bending, and (ii) combined torsional and direct loading, Numericals.

Unit II

Unsymmetrical Bending: Properties of beam cross section, product of inertia, ellipse of inertia, slope of the neutral axis, stresses & deflections, shear center and the flexural axis Numericals. Thin Walled Vessels : Hoop & Longitudinal stresses & strains in cylindrical & spherical vessels & their derivations under internal pressure, wire would cylinders, Numericals.

UNIT III

Thick Cylinders & Spheres : Derivation of Lame's equations, radial & hoop stresses and strains in thick, and compound cylinders and spherical shells subjected to internal fluid pressure only, wire wound cylinders, hub shrunk on solid shaft, Numericals. Rotating Rims & Discs: Stresses in uniform rotating rings & discs, rotating discs of uniform strength, stresses in (I) rotating rims, neglecting the effect of spokes, (ii) rotating cylinders, hollow cylinders & solids cylinders. Numericals.

UNIT IV

Bending of Curved Bars : Stresses in bars of initial large radius of curvature, bars of initial small radius of curvature, stresses in crane hooks, rings of circular & trapezoidal sections, deflection of curved bars & rings, deflection of rings by Castigliano's theorem stresses in simple chain link, deflection of simple chain links, Problems. Springs: Stresses in open coiled helical spring subjected to axial loads and twisting couples, leaf springs, flat spiral springs, concentric springs, Numericals.

Text Books:

1. Strength of Materials – G.H.Ryder, Third Edition in SI Units 1969 Macmillan, India.
2. Mechanics of Materials – (Metric Edition) : Ferdinand P. Beer and E. Russel Johnston, Jr. Second Edition, McGraw Hill.

Reference Books :

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1. Book of Solid Mechanics – Kazmi, Tata Mc Graw Hill
2. Strength of Materials – D.S. Bedi - S. Chand & Co. Ltd.
3. Advanced Mechanics of Solids and Structures – N. Krishan Raju and D.R.Gururaje- Narosa Publishing House.
4. Strength of Materials – Andrew Pytel and Fredinand L. Singer Fourth Edition, Int. Student Ed. Addison – Wesley Longman.

NOTE: In the semester examination, the examiner will set 8 questions, at least Two question from each unit, and students will be required to attempt only 5 questions one from each unit.

B.Tech. (Fourth semester) Mechanical engineering
ME- 208 E FLUID MECHANICS

L	T	P
3	1	-

Sessional	: 50 Marks
Theory	: 100 Marks
Total	: 150 Marks
Duration of Exam	: 3 Hrs.

Unit I

Fluid Properties and Fluid Statics: Concept of fluid and flow, ideal and real fluids, continuum concept, properties of fluids, Newtonian and non-Newtonian fluids. Pascal's law, hydrostatic equation, hydrostatic forces on plane and curved surfaces, stability of floating and submerged bodies, relative equilibrium. Problems. Fluid Kinematics: Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation, differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity and circulation, stream and potential functions, flow net. Problems.

Unit II

Fluid Dynamics: Concept of system and control volume, Euler's equation, Bernoulli's equation, venturimeter, orifices, orificemeter, mouthpieces, kinetic and momentum correction factors, Impulse momentum relationship and its applications. Problems.Potential Flow: Uniform and vortex flow, flow past a Rankin half body, source, sink, source-sink pair and doublet, flow past a cylinder with and without circulation. Problems.

UNIT III

Viscous Flow: Flow regimes and Reynold's number, Relationship between shear stress and pressure gradient, uni-directional flow between stationary and moving parallel plates, movement of piston in a dashpot, power absorbed in bearings. Problems. Flow Through Pipes: Major and minor losses in pipes, Hagen-Poiseuilli law, hydraulic gradient and total energy lines, series and parallel connection of pipes, branched pipes; equivalent pipe, power transmission through pipes. Problems.

UNIT IV

Boundary Layer Flow: Boundary layer concept, displacement, momentum and energy thickness, von-karman momentum integral equation, laminar and turbulent boundary layer flows, drag on a flat plate, boundary layer separation and control. Streamlined and bluff bodies, lift and drag on a cylinder and an airfoil, Problems. Turbulent Flow: Shear stress in turbulent flow, Prandtl mixing length hypothesis, hydraulically smooth and rough pipes, velocity distribution in pipes, friction coefficients for smooth and rough pipes. Problems.

Text Books:

1. Fluid Mechanics – Streeter V L and Wylie E B, Mc Graw Hill
2. Mechanics of Fluids – I H Shames, Mc Graw Hill

References Books:

1. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G. Biswas, TMH
2. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S.K. Kataria and Sons
3. Fluid Mechanics and Machinery – S.K. Agarwal, TMH, New Delhi

NOTE: In the semester examination, the examiner will set 8 questions, at least Two question from each unit, and students will be required to attempt only 5 questions one from each unit.

B.Tech. (Fourth semester) Mechanical engineering

MET –210 E DYNAMICS OF MACHINES

L	T	P
3	1	-

Sessional	: 50 Marks
Theory	: 100 Marks
Total	: 150 Marks
Duration of Exam	: 3 Hrs.

UNIT I

Static force analysis, Static equilibrium, free by diagram, Analysis of static forces in mechanism. D'Alembert's principal, Equivalent offset inertia force, Dynamics of reciprocation parts, Piston effort, Crank effort, Equivalent dynamical systems, and Inertia force in reciprocating engines by graphical and analytical method. Turning moment and crank effort diagrams for single cylinder and multi-cylinder engines, coefficient of fluctuation of energy, coefficient of fluctuation of speed, flywheel and its function.

UNIT II

Types of gears, terminology, condition for correct gearing, cyclical and involutes profiles of gear teeth, pressure angle, path of contact, arc of contact, Interference, undercutting, minimum number of teeth, number of pairs of teeth in contact, helical, spiral, worm and worm gear, bevel gear. Gear trains; simple, compound, reverted, and epicyclical, Solution of gear trains, sun and planet gear, bevel epicyclical gear, compound epicyclical gear, pre-selective gear box, differential of automobile, torque in gear taints.

UNIT III

Types of brakes, friction brakes, external shoe brakes, band brakes, band and block brakes, internal expanding shoe brake, dynamometers; absorption, and tensional. Types of governors; watt, Porter, Proell, spring loaded centrifugal, Inertia,, Sensitiveness, Stability, Isochronism's, Hunting, Effort and power of governor, controlling force, Static and dynamic balancing of rotating parts, balancing of I. C. Engines, balancing of multi-cylinder engine; V-engines and radial engines, balancing of machines.

UNIT IV

Gyroscope, Gyroscopic couple and its effect on craft, naval ships during steering, pinching and rolling, Stability of an automobile (2-wheeers), Introduction, open and closed lop control, terms related to automatic control, error detector, actuator, amplification, transducers, lag in responses, damping, block diagrams, system with viscous damped output, transfer functions, relationship between open –loop and closed loop transfer function.

Suggested reading:

1. Theory of machines:
   S. S. Rattan, Tata McGraw Hill Publications.
2. Theory of Mechanism and Machines:
   Jagdish Lal, Metropolitan Book Co.
3. Mechanism synthesis and analysis:
   A.H. Soni, McGraw Hill Publications.
4. Mechanism:
   J.S. Beggs.
5. Mechanics of Machines:
   P.Black, Pergamon Press.
6. Theory of Machines:
   P.L.Ballaney, Khanna Publisher.

NOTE: In the semester examination, the examiner will set 8 questions, at least Two question from each unit, and students will be required to attempt only 5 questions one from each unit.

B.Tech. (Fourth semester) Mechanical engineering

ME- 214 E FLUID MECHANICS LAB

L	T	P
-	-	3

Sessional : 25 Marks
Practical/Viva : 25 Marks
Total : 50 Marks
Duration of Exam. : 3 Hrs.

List of Experiments:

1. To determine the coefficient of impact for vanes.
2. To determine coefficient of discharge of an orificemeter.
3. To determine the coefficient of discharge of Notch (V and Rectangular types).
4. To determine the friction factor for the pipes.
5. To determine the coefficient of discharge of venturimeter.
6. To determine the coefficient of discharge, contraction & velocity of an orifice.
7. To verify the Bernoullis Theorem.
8. To find critical Reynolds number for a pipe flow.
9. To determine the meta-centric height of a floating body.
10. To determine the minor losses due to sudden enlargement, sudden contraction and bends.
11. To show the velocity and pressure variation with radius in a forced vertex flow.

Note:

1. **At least ten experiments are to be performed in the semester.**

2. **At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.**

B.Tech. (Fourth semester) Mechanical engineering

ME- 212 E PRODUCTION TECHNIOLOGY LAB

L	T	P
-	-	4

Sessional	: 50 Marks
Practical/Viva	: 50 Marks
Total	: 100 Marks
Duration of Exam	: 4 Hrs

List of Experiments:

Introduction to milling machines its types functions applications etc.

1. Practice of slab milling on milling machine.
2. Practice of slotting on milling machine.
3. To cut gear teeth on milling machine using dividing head.
4. Introduction to gear hobber, demonstration of gear hobbing and practice.
5. Introduction to various grinding wheels and demonstration on the surface grinder.
6. Introduction to tool and cutter grinder and dynamometer.
7. Study the constructional detail and working of CNC lathes Trainer.
8. To carry out welding using TIG/MIG welding set.
9. Introduction, demonstration & practice on profile projector & gauges.
10. To make a component on lathe machine using copy turning attachment.
11. To cut external threads on a lathe.
12. To cut multi slots on a shaper machine.
13. To perform drilling and Boring operation on a Component.

1. **At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.**

B.Tech. (Fourth semester) Mechanical engineering
ME 216 E DYNAMICS OF MACHINE (PRACTICAL)

L	T	P
-	-	3

Sessional	: 25 Marks
Practical/Viva	: 25 Marks
Total	: 50 Marks
Duration of Exam	: 3 Hrs

LIST OF EXPERIMENT

1. To determine experimentally, the moment of inertia of a flywheel and axle compare with theoretical values.
2. To find out critical speed experimentally and to compare the whirling speed of a shaft with theoretical values.
3. To find experimentally the Gyroscopic couple on motorized gyroscope and compare with applied couple.
4. To perform the experiment of balancing of rotating parts and finds the unbalanced couple and forces.
5. To determine experimentally the unbalance forces and couples of reciprocating parts.
6. To calculate the torque on a planet carrier and torque on internal gear using epicyclic gear train and holding torque apparatus.
7. To study the different types of centrifugal and inertia governors and demonstrate any one.
8. To study the automatic transmission unit.
9. To study the differential types of brakes.
10. To find out experimentally the corli and component of accelaration and compare with theoretical values.

At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

B.Tech. (Fifth semester) Mechanical engineering

ME 301 E I.C.ENGINE AND GAS TURBINES

L	T	P/D	Total
3	1	-	4

Theory: 100 Marks
Sessional: 50 marks
Duration of Exam: 03 hours

UNIT 1

Heat engines; Internal and external combustion engines; Classification of I.C. Engines; Cycle of operations in four strokes and two-stroke IC engines; Wankle Engine.

Assumptions made in air standard cycles; Otto cycle; Diesel cycle; Dual combustion cycle; Comparison of Otto, diesel and dual combustion cycles; Sterling and Ericsson cycles; Air standard efficiency, Specific work output. Specific weight; Work ratio; Mean effective pressure; Deviation of actual engine cycle from ideal cycle.

UNIT II

Mixture requirements for various operating conditions in S.I. Engines; Elementary carburetor, Calculation of fuel air ratio; The complete carburetor; Requirements of a diesel injection system; Type of injection system; Petrol injection; Requirements of ignition system; Types of ignition systems, ignition timing; Spark plugs.

S.I. engines; Ignition limits; Stages of combustion in S. I. Engines; Ignition lag; Velocity of flame propagation; Detonation; Effects of engine variables on detonation; Theories of detonation; Octane rating of fuels; Pre-

ignition; S.I. engine combustion chambers. Stages of combustion in C.I. Engines; Delay period; Variables affecting delay period; Knock in C.I. Engines; Cetane rating; C.I. Engine combustion chambers.

UNIT III

Functions of a lubricating system, Types of lubrication system; Mist, Wet sump and dry sump systems; Properties of lubricating oil; SAE rating of lubricants; Engine performance and lubrication; Necessity of engine cooling; Disadvantages of overcooling; Cooling systems; Air-cooling, Water-cooling; Radiators.

Performance parameters; BHP, IHP, Mechanical efficiency; Brake mean effective pressure and indicative mean effective pressure, Torque, Volumetric efficiency; Specific fuel consumption (BSFG, ISFC); Thermal efficiency; Heat balance; Basic engine measurements; Fuel and air consumption, Brake power, Indicated power and friction power, Heat lost to coolant and exhaust gases; Performance curves;

UNIT IV

Pollutants from S.I. and C.I. Engines; Methods of emission control, Alternative fuels for I.C. Engines; The current scenario on the pollution front.

Working of a single stage reciprocating air compressor; Calculation of work input; Volumetric efficiency; Isothermal efficiency; Advantages of multi stage compression; Two stage compressor with inter-cooling; Perfect inter cooling; Optimum intercooler pressure; Rotary air compressors and their applications; Isentropic efficiency.

Brayton cycle; Components of a gas turbine plant; Open and closed types of gas turbine plants; Optimum pressure ratio; Improvements of the basic gas turbine cycle; Multi stage compression with inter-cooling; Multi stage expansion with reheating between stages; Exhaust gas heat exchanger; Application of gas turbines.

Recommended books

- Internal combustion engine by Ramalingam scitech publication
- Internal combustion engine by Ganeshan TMG
- Internal combustion engine by Mathur & Sharma
- Heat power engineering by Dr. V.P. Vasandhani & Dr. D.S. Kumar

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Fifth semester) Mechanical engineering

ME 303 E **FLUID MACHINES**

L	T	P/D	Total
3	1	-	4

Theory: 100 Marks
Sessional: 50 marks
Duration of Exam: 03 hours

UNIT I

Impact of jet stationary and moving flat and curved plates, Force on series of vanes, Radial vanes, Vortex motion, Free and forced vortex , jet propulsion of ships

Units and dimensions; Dimensional homogeneity; Dimensional analysis' methods; Ray Leigh and Buckingham methods, Applications and limitations of dimensional analysis Dimensionless numbers, Similitude laws.

UNIT II

Introduction; Development of hydraulic turbines; Components of hydropower plant; Classification of turbines; Surge tank and its type.

Pelton turbine, Its components, Number and dimension of buckets, Speed ratio, Jet ratio, Energy conversion, Condition for maximum efficiency; Design considerations. Governing etc.

Francis turbine, its components, working principles. Draft tube, Types of draft tube, Design considerations; Outward vs. Inward flow reaction turbines, Introduction to Deriaz turbine, Evolution of axial flow turbines, Kaplan turbine, Operation at off-design loads, Governing etc.

Unit quantities, Specific speed, Runway speed, Characteristics of turbines,

UNIT III

Introduction, Classification, Components, Principle of working, various heads, Energy conversion, Euler's head and its variation with vane shapes. Effect of finite number of vanes, Losses and efficiencies, Minimum starting speed, Limitation of suction lift, Net Positive Suction Head (NPSH); Multistage pumps, Specific speed and performance.

Working principles, Classification, Components, Discharge, Discharge slip, Power input, Indicator diagram, Effect of friction, Acceleration and pipe friction, Maximum speed, Air vessels, Comparison with centrifugal pumps. Model testing of pumps.

UNIT IV

Cavitations and its effects, Cavitation parameters, Detection and Prevention of cavitations. Model testing of turbine

Propeller pump, Jet pump, Airlift pump, Gear pump, Screw pump, Vane pump, Radial piston pump, Submersible pump, Pump problems

Hydraulic accumulators, Hydraulic intensifier, Hydraulic lift, Hydraulic crane. Hydraulic coupling, Torque converter, Hydraulic ram.

Recommended books

- **Fluid mechanics and machinery by S.K.Aggarwal TMG**
- **Fluid mechanics & fluid power engineering by D.S kumar, Katson publisher**
- **Fluid mechanics and Hydraulic machine by S.S rattan, Khanna publisher**
- **Introduction to fluid mechanics and machinery by Som and Bishwas, TMH**

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Fifth semester) Mechanical engineering

ME 305 E **HEAT - TRANSFER**

L	T	P/D	Total
3	1	-	4

Theory: 100 Marks
Sessional: 50 marks
Duration of Exam: 03 hours

UNIT I

Definition of heat; Modes of Heat Transfer; Basic Laws of heat transfer, Electrical Analogy of heat conduction; Conduction through composite Walls; Overall heat transfer coefficient.

The general conduction equation in Cartesian, cylindrical and spherical coordinates Steady one dimensional heat conduction without internal heat generation; The plane slab; The cylindrical shell; The spherical shell; Critical thickness of insulation; Variable thermal conductivity, Steady one dimensional heat conduction with uniform internal heat generation the plane slab; Cylindrical and spherical systems; Fins of uniform cross section; Governing equation; Temperature distribution and heat dissipation rate; Efficiency and effectiveness of fins.

UNIT II

Free and forced convection; Newton's law of cooling, Convective heat transfer Coefficient; Nusselt number; Dimensional analysis of free and forced convection; Analytical solution to forced convection problems; The concept of boundary layer; Hydrodynamic and thermal boundary layer; Momentum and Energy equations for boundary layer; Exact solution for laminar flow over an isothermal plate using similarity transformation; The integral approach; Integral momentum and energy equations; Solution of forced convection over a flat plate using the integral method. Analysis of free convection; governing equations for velocity and temperature fields. Relation between fluid friction and heat transfer, Reynolds analogy Dimensionless numbers; Reynolds, Prandtl

Nusselt , Grashoff and Stanton Numbers and their significance, Heat transfer with change of phase; Nusselt theory of laminar film Condensation.

UNIT III

Theories of thermal radiation; Absorption, Reflection and transmission, Monochromatic and total emissive power; Black body concept; Planck's distribution law; Stefan Boltzman law; Wien's displacement law; Lambert's cosine law; Kirchoff's law; Shape factor; Heat transfer between black surfaces.

UNIT IV

Introduction; Classification of heat exchangers; Logarithmic mean temperature Difference; Area calculation for parallel and counterflow heat exchangers; Effectiveness of heat exchangers; N T U method of heat exchanger design; Applications of heat exchangers.

Reference and Text books:

- A Text book of Heat Transfer by S.P Sukhatme, university press
- Heat transfer by Holman, TMG
- Heat and Mass transfer by D.S Kumar

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Fifth semester) Mechanical engineering

ME 307 E **INDUSTRIAL ENGINEERING**

L	T	P/D	Total
3	1	-	4

Theory: 100 Marks

Sessional: 50 marks

Duration of Exam: 03 hours

UNIT I

Introduction to work study; Method study; Basic procedure; Recording techniques (charts and diagrams); Elemental breakdown; Micro-motion studies; Therbligs; SIMO-chart; Principles of motion –economy.

Introduction; Objectives; technique; (time) information recording; methods of timings; Time study allowances; Work sampling technique; Performance rating and its determination PMTS; M. T. M.; Work factor.

UNIT II

Principles of organization, Importance and characteristics of organization, Organization theories; Classical Organization theory; Neo-Classical organization theory, Modern organization theory; Types of organization, Military or line organization, Functional organization, Line and staff organization, Committees.

Objectives of PPC; Functions of PPC; Preplanning and planning; Routing; Estimating; scheduling-master schedule; Daily schedule; Gantt chart; Dispatching –centralized vs. decentralized; Control; Follow up and progress reporting.

Introduction; Product development; Product characteristics; Role of product development; 3Ss – Standardization; Simplification and Specialization.

UNIT III

Introduction, Objectives and importance of sales forecasting, Types of forecasting, Methods of sales forecasting-Collective opinion method, Delphi technique, economic indicator method; Regression analysis, Moving average method, Time series analysis.

Introduction, Functions of inventory; Types of inventory; Control importance and functions, Inventory costs, Factors affecting inventory control, Various inventory control models. A. B. C. analysis, Lead-time calculations.

UNIT IV

Introduction; Objectives; Concept and life cycle of a product and V.E.; Steps in VE., Methodology and techniques, Fast diagram, Matrix method.

Various concepts in industrial engineering

a) WAGES AND INCENTIVES; -Concept; Types; Plans; Desirable characteristics.
b) ERGONOMICS; - its importance; Man-machine work place system; Human factors considerations in system design.
c) SUPPLY CHAIN MANAGEMENT; - its definition, Concept, Objectives, Applications, benefits, Some successful cases in Indian Industries.
d) JIT; - Its definition, Concept, Importance, Misconception, Relevance, Applications, Elements of JIT (brief description).
e) MRP;-Introduction, Objectives, factors, Guide lines, Techniques Elements of MRP system, Mechanics of MRP, MRP-II
f) TIME MANAGEMENT;-Introduction, Steps of time management, Ways for saving time, Key for time saves.

Reference and Text books:

- Production planning and control by S.Elion
- Modren production Management by S.S Buffa
- Industrial engg. and management manufacturing system by Surender kumar, Satya prakashan
- Essence of Supply Chain Management by R.P mohanty and S.G Deshmukh
- Industrial engg. and management by S Sharma and Savita sharama

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Fifth semester) Mechanical engineering

ME 309 E **Machine Design- 1**

L	T	P/D	Total
2	-	5	7

Theory: 100 Marks
Sessional: 50 marks
Duration of Exam: 03 hours

UNIT I

Properties: Chemical, Physical, Mechanical and Dimensional; Ferrous metals, Non-ferrous metals, Plastics, Composite materials etc.; Selection of Engineering Materials.

Design methodology; Design criterion based on fracture; Deformation and elastic stability design stresses; Factor of safety; Significant stress and significant strength; Stresses-concentration; Causes and mitigation; Endurance limit; Effect of concentration; Notch sensitivity; Size and surface finish; Goodman diagram; Gerber's parabola and Soderberg line.

UNIT II

Supports and retainment of rotating assemblies; manufacturing considerations of design, design of castings and weldments.

Riveted joints for boiler shell according to I. B. R.; riveted structural joint; and riveted joint with eccentric loading; Types of welded joints; strength of welds under axial load; Welds under eccentric loading; Designation of various types of bolts and nuts, Design of bolted joints, Bolts of uniform strength, Bolted joints with eccentric loads, Design of Keys, Cotter joint and knuckle joints.

UNIT III

Design of shafts subjected to pure torsion; Pure bending load; Combined bending and torsion; Combined torsion; Bending and axial loads.

Introduction, hand and foot levers, cranked lever, lever for a lever safety valve, Bell crank lever. Miscellaneous levers.

UNIT IV

Types of shaft couplings, Design of sleeve or muff coupling; Flange coupling and bush type flexible couplings.

Introduction, Design of circular, oval shaped and square flanged pipe joints.

Function, types of power screws, stresses in screws, design calculations.

References and text books:

- Design of machine element By Bhandari
- Machine design by Malvee and Hartmann, CBS publication
- Machine design by Sharma and Aggarwal
- PSG Design Data Book PSG College of Engg PSG Publication
- Machine Design an integrated Approch Robert l Norton, prentice hall
- Fundamental of machine component design R.C Juvinnal, Johan wiley& sons

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Fifth semester) Mechanical engineering

ME 311 E STEAM GENERATION & POWER

L	T	P/D	Total
3	1	-	4

Theory: 100 Marks
Sessional: 25 marks
Duration of Exam: 03 hours

UNIT I

Introduction; classification of boilers; comparison of fire tube and water tube boiler; their advantages; description of boiler; Lancashire; locomotive; Babcock; Wilcox etc.; boiler mountings; stop valve; safety valve; blow off valve; feed check etc.; water level indicator; fusible plug; pressure gauge; boiler accessories; feed pump; feed water heater; preheater; superheater; economizer; natural draught chimney design; artificial draught; stream jet draught; mechanical draught; calculation of boiler efficiency and equivalent evaporation(no numerical problem)

UNIT II

Carnot cycle; simple and modified Rankine cycle; effect of operating parameters on rankine cycle performance; effect of superheating; effect of maximum pressure; effect of exhaust pressure; reheating and regenerative Rankine cycle; types of feed water heater; reheat factor; binary vapour cycle.

Simple steam engine, compound engine; function of various components.

UNIT III

Function of steam nozzle; shape of nozzle for subsonics and supersonics flow of stream; variation of velocity; area of specific volume; steady state energy equation; continuity equation; nozzle efficiency; critical pressure ratio for maximum discharge; physical explanation of critical pressure; super saturated flow of steam; design of steam nozzle.

dvantage of steam condensation; component of steam condensing plant; types of condensers; air leakage in condensers; Dalton's law of partial pressure; vacuum efficiency; calculation of cooling water requirement; air expansion pump.

UNIT IV

Introduction; classification of steam turbine; impulse turbine; working principal; compounding of impulse turbine; velocity diagram; calculation of power output and efficiency; maximum efficiency of a single stage impulse turbine; design of impulse turbine blade section; impulse reaction turbine; working principle; degree of reaction; parsons turbine; velocity diagram; calculation of power output; efficiency of blade height; condition of maximum efficiency; internal losses in steam turbine; governing of steam turbine.

Text Books :

1. Thermal Engineering – P L Ballaney, Khanna Publishers

2. Thermodynamics and Heat Engines vol II – R Yadav, Central Publishing House

Reference Books :

1. Applied Thermodynamics for Engineering Technologists – T D Eastop and A McConkey, Pearson Education
2. Heat Engineering – V P Vasandani and D S Kumar, Metropolitan Book Co Pvt Ltd

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Fifth semester) Mechanical engineering

ME 313 E

Thermal Engineering (Practical)

L	T	P/D	Total
-	-	2	2

Theory: 25 Marks
Sessional: 25 marks
Duration of Exam: 03 hours

List of Experiments

1. To make a trial on single cylinder 4-stroke Diesel Engine to calculate B. H. P., S.F.C. and to draw its characteristics curves.
2. To make a trial on 4-stroke high-speed diesel engine and to draw its Heat Balance Sheet.
3. To make a trial on Wiley's jeep Engine at constant speed to calculate B. H. P., S. F. C. Thermal efficiency and to draw its characteristic Curves.
4. To make Morse Test to calculate IHP of the multi cylinder petrol engine and to determine its mechanical efficiency.
5. To calculate the isothermal efficiency and volumetric efficiency of a 2 stage reciprocating air compressor.
6. To find out the efficiency of an air Blower.
7. To make a trial on the Boiler to calculate equivalent evaporation and efficiency of the Boiler.
8. To study the following models;
    a. Gas Turbine.
    b. Wankle Engine.
9. To study
    a. Lubrication and cooling systems employed in various I. C. Engines in the Lab

b. Braking system of automobile in the lab

10. To study a Carburetor.
11. To study (1) the Fuel Injection System of a C. I. Engine.
    a. (11) Battery Ignition system of a S. I. Engine
12. To study Cooling Tower.
13. To study multi Cylinder four strokes vertical Diesel Engine test RIG With Hydraulic Dynamometer.

Note: **Total Ten experiments must be performed**. **At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or outside the list.**

B.Tech. (Fifth semester) Mechanical engineering

ME 315 E **Fluid Machines (Practical)**

L	T	P/D	Total
-	-	2	2

Theory: 25 Marks
Sessional: 25 marks
Duration of Exam: 03 hours

List of Experiments

1. To study and perform lest on the Pelton wheel and to plot curves Q, P Vs N at full, three fourth gate opening.
2. To study and perform test in the Francis Turbine and to plot curves Q, P Vs N at full, three- fourth gate opening.
3. To study and perform test on the Kaplan Turbine and to plot curves Q, P Vs N at full, three- fourth half opening.
4. To study and perform test on Centrifugal Pump and to plot curves η, Power Vs Q
5. To study and perform test on a Hydraulic Ram and to find its Rankine, Aubussion η.
6. To study and perform test on a Reciprocating pump and to plot the P and ηVs H
7. To study and perform test on a Gear Pump and to plot the curves Q.P Vs Pressure rise.
8. Study and perform test on a Torque Convertor and to plot the curves η& Np.

B.Tech. (Fifth semester) Mechanical engineering

ME 317 E

Heat Transfer (Practical)

L	T	P/D	Total
-	-	2	2

Theory: 25 Marks
Sessional: 25 marks
Duration of Exam: 03 hours

List of Experiments

1. Determination of thermal conductivity of a metal rod
2. Determination of thermal conductivity of an insulating powder
3. Determination of thermal conductivity of a liquid using Guard plate method
4. Determination of thermal resistance of a composite wall
5. Temperature distribution of a pin fin in free-convection
6. Temperature distribution of a pin fin in forced-convection
7. Forced convection heat transfer from a cylindrical surface
8. Determination of Electiveness of a Heat exchanger
9. Determination of Stefan-Boltzman constant
10. Performance of Solar still
11. Determination of critical heat flux
12. Performance of solar water heater

13. Measurement of solar radiation using solar integrator.

Note: **Total Ten experiments must be performed. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or outside the list.**

B.Tech. (Fifth semester) Mechanical engineering

ME 319 E **Industrial Engineering (Practical)**

L	T	P/D	Total
-	-	2	2

Theory: 25 Marks
Sessional: 25 marks
Duration of Exam: 03 hours

List of Experiments

1. To study various Rating Factor systems and find standard time for making small sand mould.
2. To study various plat layouts and suggest improvements in existing Machines Shop layout.
3. To study and draw organizational structure of a near by industry and suggest changes.

4. To draw X and R charts for a given sample of products to check their acceptance.
5. To draw p chart for a given product lot and verify its acceptance
6. Draw a flow process chart with time estimates for a simple welding process.
7. Draw a two handed process chart for a simple process of a job preparation on a lathe.
8. To study various purchase procedures and draw organizational structure of college purchase department.
9. A case study on ABC/VED analysis.
10. A case study on Quality Improvement Techniques (e.g. Hostel Mess/ Workshop / Canteen etc.)
11. A market survey and analysis.
12. A "preliminary project report" preparation for any small-scale unit.

Note: **Total Ten experiments must be performed. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or outside the list.**

B.Tech. (Sixth semester) Mechanical engineering

ME 302 E Refrigeration and Air-Conditioning

L	T	P/D	Total	
3	1	-	4	

Theory: 100 Marks

Sessional: 50 marks

Duration of Exam: 03 hours

(a) Refrigeration

UNIT I

Basics of heat pump & refrigerator; Carnot's refrigeration and heat pump; Units of refrigeration; COP of refrigerator and heat pump; Carnot's COP; ICE refrigeration; evaporative refrigeration; refrigeration by expansion of air; refrigeration by throttling of gas; Vapor refrigeration system; steam jet refrigeration; thermoelectric cooling; adiabatic demagnetization.

Basic principles of operation of air refrigeration system, Bell-Coleman air refrigerator; advantages of using air-refrigeration in aircrafts; disadvantages of air refrigeration in comparison to other cold producing methods; simple air refrigeration in air craft; simple evaporative type air refrigeration in aircraft; necessity of cooling the aircraft.

UNIT II

Simple Vapor Compression Refrigeration System; different compression processes(wet compression, dry or dry and saturated compression, superheated compression); Limitations of vapour compression refrigeration system if used on reverse Carnot cycle;

representation of theoretical and actual cycle on T-S and P-H charts; effects of operating conditions on the performance of the system; advantages of vapour compression system over air refrigeration system.

Methods of improving COP; flash chamber; flash inter cooler; optimum interstate pressure for two stage refrigeration system; single expansion and multi expansion processes; basic introduction of single load and multi load systems; Cascade systems.

Basic absorption system; COP and Maximum COP of the absorption system; actual NH_3 absorption system; functions of various components; Li-Br absorption system; selection of refrigerant and absorbent pair in vapour absorption system; Electro refrigerator; Comparison of Compression and Absorption refrigeration systems; nomenclature of refrigerants; desirable properties of refrigerants; cold storage and ice-plants.

(b) Air conditioning

UNIT III

Difference in refrigeration and air conditioning; Psychometric properties of moist air (wet bulb, dry bulb, dew point temperature, relative and specific humidity of moist air, temperature of adiabatic saturation); empirical relation to calculate P_v in moist air.

Psychometric chart, construction and use, mixing of two air streams; sensible heating and cooling; latent heating and cooling; humidification and dehumidification; cooling with dehumidification; cooling with adiabatic humidification; heating and humidification; by-pass factor of coil; sensible heat factor; ADP of cooing coil; Air washer.

UNIT IV

Classification; factors affecting air conditioning systems; comfort air-conditioning system; winter air conditioning system; summer air-conditioning system; year round air conditioning. unitary air-conditioning system; central air conditioning system; room sensible heat factor; Grand sensible heat factor; effective room sensible heat factor.

Inside design conditions; comfort conditions; components of cooling loads; internal heat gains from (occupancy, lighting, appliances, product and processes); system heat gain (supply air duct, A.C. fan, return air duct); external heat gain (heat gain through building, solar heat gains through outside walls and roofs); solar air temperature; solar heat gain through glass areas; heat gain due to ventilation and infiltration.

Transport air conditioning; evaporative condensers, cooling towers; heat pumps.

References and Text books

Refrigeration and air-conditioning by C.P arora

Basic Refrigeration and air-conditioning by Annanthana and Rayanan, TMG

Refrigeration and air-conditioning BY Arora and Domkundwar, Dhanpat rai

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Sixth semester) Mechanical engineering

ME 304 E TRIBOLOGY

L	T	P/D	Total	
3	1	-	4	**Theory: 100marks**
				Sessional: 50 marks

Duration of Exam: 03 hours

UNIT I

Introduction to trobological systems and their characteristic features; analysis and assessment of surface; topography; deterministic and stochastic tribo-models for asperity contacts; techniques of surface examination; technological properties of surfaces.

Quantitative laws of sliding friction, causes of friction, adhesion theory, laws of rolling friction, measurement of friction

UNIT II

Introduction, mechanism of wear, types of wear, quantitative laws of wear, measurement of wear, wears resistance materials

UNIT III

Introduction, dry friction, boundary lubrication, hydrodynamic, hydrostatic and elasto-hydrodynamic lubrication, functions of lubricants, types and properties, lubricant additives.

Principles, application to rolling contact bearings, cams, Gears

UNIT IV

Geometry and pressure equation of journal bearing, hydrostatic bearings, thrust bearings, porous bearings and hydrodynamic gas bearings. Journal bearings with specialized applications. General requirements and different types of bearing materials.

Suggested Reading

Tribology in Indertrion- By Sushil Kumar Srivastava

Introduction to Tribology of Bearings- By B.C. Majumdar ; A.H.Wheeler

Principles of Tribology – By J. Halling, Macmillan

Mechanics and Chemistry in Lubrication- By Dorinson and Ludema , Elsevier

Friction and wear of Materials- By E. Robinowicz, Johan Wiley

Principles of Lubrication-By A. Cameron, Longmans

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Sixth semester) Mechanical engineering

ME 306 E **MECHANICAL VIBRATION**

L	T	P/D	Total
3	1	-	4

Theory: 100 Marks
Sessional: 50 marks
Duration of Exam: 03 hours

UNIT I

Kinematics of simple vibrating motion, Simple harmonic motions, Vectorial representation of harmonic motion. Degree of freedom, Equations of motions, general solution of free vibration, Phase plane method

UNIT II

Damped free vibration, undamped and damped forced vibrations, Vibrating isolation, Vibrating instruments.

Undamped free vibration ,Principle modes , Influence coefficients, Coordinate coupling, Orthogonality, Vibration absorbers.

UNIT III

Geometric method, Stability of equilibrium points, Method of harmonic balance.

Influence coefficients, Dunkerleys equation, Matrix iteration, Holzer method, Rayleigh method, and Rayleigh-Ritz method.

UNIT IV

Transverse vibration of strings, Longitudinal vibrations of bars, Lateral vibration of beams, Torsional vibration of circular shafts, Whirling of shafts.

Introduction, Method of Laplace transformation and response to an impulsive output, response to step-input, pulse-input, and phase plane method.

REFERENCE AND TEXT BOOKS: -

Mechanical vibration - By G.K. Grover; Nemchand Chand and Sons
Mechanical Vibration – By Thomson; Prentice Hall
Mechanical Vibration - By Den Hartog; Mc Graw Hill
Introductory course to mechanical vibrations – By Rao and Gupta; Wiley Eastern

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Sixth semester) Mechanical engineering

ME 308 E COMPUTER AIDED DESIGN AND MANUFACTURING

L	T	P/D	Total	
4	1	-	5	**Theory: 100 Marks**
				Sessional: 50 marks

Duration of Exam: 03 hours

UNIT I

Introduction to CAD/CAM, Historical Development, Industrial look at CAD/CAM, Introduction to CIM Basic of Geometric & Solid modeling,

Coordinate systems, Explict, Implict, Intrinsic and parametric equation

Part families, Part classification and coding, product flow analysis, Machine cell Design, Advantages of GT

UNIT II

Introduction, Transformation of points & line, 2-D rotation, Reflection, Scaling and combined transformation, Homogeneous coordinates, 3-D scaling, shearing, rotation, reflection and translation, combined transformations, Orthographic and perspective projections

Algebric and geometric forms, tangent & normal blending functions, reparametrization

Straight line, conics, cubic splines, Bezier curves and B-spline curves

UNIT III

Algebraic and geometric forms, tangent & twist vectors, normal blending function, reparametrization, Sixteen point form, four Curve form, Plane surface, ruled surface

Surface of revolution, tabulated cylinder Bi-cubic surface, bezier surface, B-spline surface

Solid models and representation scheme B-rep & CSG, sweep representation ,Cell decomposition, spatial occupancy enumeration

UNIT IV

Introduction, fixed programmable and flexible automation, Types of NC systems, MCU & other components, Co-ordinate system, NC manual part programming, G & M codes, part program for simple parts, Computer assisted part programming

Introduction, FMS component, Types of FMS, FMS layout, Planning for FMS, advantage and applications

Introduction, conventional process planning, Steps in variant process planning, types of CAPP, planning for CAPP

Suggested Reading:

- CAD/CAM theory & practice (Ibrahim Zeid)
- CAD/CAM (Groover & Zimmer)
- Numerical control and computer aided manufacturing by RAO and Tiwari, Tmg

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.TECH. (SIXTH SEMESTER) MECHANICAL ENGINEERING

ME 310 E MACHINE DESIGN II

L	T	P/D	Total	
2	**-**	**6**	**8**	**Theory: 100Marks**
				Sessional: 50 marks

Duration of Exam: 04 hours

UNIT I

Classification of Gears; Selection of type; Law of Gearing, Standard system of Gear tooth, VariousFailure modes, Interference, undercutting & minimum no. Of teeth

Force Analysis ,Beam strength of Gear tooth, Effective load on tooth, Estimation of module based on beam strength and wear strength, Gear lubrication, materials; Design Procedure, Gear Box design

Terminology, Force Analysis, Virtual no. of teeth, Beam strength, Effective load, Wear strength

Terminology, force analysis, beam strength & wear strength, effective load on gear tooth

Terminology, properties, force analysis, friction, material selection

UNIT II

Design of flat belts &Pulleys, Design /selection of V belts &Pulleys, Design/selection of wire ropes, Design/selection of chains

Single &multiple Plate clutch, Cone clutch

External shoe brake, Internal shoe brakes

UNIT III

Coil Springs, Leaf Springs

Hydro dynamically lubricated bearings, Selection of ball bearings, Selection of roller bearings, Selection of taper roller bearings

Mechanism Design, Design of cam & Follower

UNIT IV

Design of Cylinder, Design of Piston, Design of Crank shaft, Design of connecting rod,

Design of Crane Hook Design of Flywheels

SUGGESTED READING:

- Design of Machine Elements Bhandari TMH
- Machine Design Sharma Aggarwal Katson Publishers
- PSG Design Data Book PSG College of Engg PSG Publication
- Machine Design an integrated Approch Robert l Norton, prentice hall
- Fundamental of machine component design R.C Juvinnal, Johan wiley& sons

NOTE: In the semester examination, the examiner will set 8 questions in all, at least two question from each unit, and students will be required to attempt only 5 questions, at least one from each unit.

B.Tech. (Sixth semester) Mechanical engineering

ME 312 E Refrigeration and Air Conditioning (Practical)

L	T	P/D	Total
-	-	2	2

Practical: 25Marks
Sessional: 25 marks
Duration of Exam: 03 hours

List of Experiments

1. Study & Performance of basic vapour compression Refrigeration Cycle.
2. To find COP of water cooler.
3. To study the walk in cooler.
4. To study and perform experiment on vapour absorption apparatus.
5. Perform the experiment & calculate various. Performance parameters on a blower apparatus.
6. To find the performance parameter of cooling tower.
7. To study various components in room air conditioner.
8. To find RH of atmosphere air by using sling Psychometric and Psychometric.
9. To find performance of a refrigeration test rig system by using different expansion devices.
10. To study different control devices of a refrigeration system.
11. To study various compressor.
12. To find the performance parameters of Ice Plant.

Note: **Total Ten experiments must be performed. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or outside the list.**

B.Tech. (Sixth semester) Mechanical engineering

ME 314 E TRIBOLOGY & MECHANICAL VIBRATION (PRACTICAL)

L	T	P/D	Total	
-	-	2	2	**Practical: 25Marks**
				Sessional: 50 marks

Duration of Exam: 03 hours

LIST OF EXPERIMENT:

1. To study undamped free vibrations of equivalent spring mass system and determine the natural frequency of vibrations
2. To study the free vibration of system for different damper settings. Draw decay curve and determine the log decrement and damping factor. Find also the natural frequency
3. To study the torsional vibration of a single rotor shaft system and to determine the natural frequency.
4. To determine the radius of gyration of given bar using bifilar suspension.
5. To verify the dunker ley's rule
6. To study the forced vibration of system with damping. Load magnification factor vs. Frequency and phase angle vs frequency curves. Also determine the damping factor.
7. To study the pressure distribution of a journal bearing using a journal bearing apparatus.
8. To determine the rate of wear of a metallic pin from the plot of displacement vs time curves by using friction and wear monitor apparatus.
9. To determine abrasion index of a material with the help of dry abrasion test rig.
10. To evaluate the load wear index and the weld point of a lubricant with the help of a four ball stream pressure tester.
11. To determine the two frequencies of torsional spring type double pendulum & compare them with theoretical values.

12. To determine the radius of gyration of a compound pendulum.
13. To determine the radius of gyration of disc using trifilar suspension.

Note: **Total Ten experiments must be performed. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or outside the list.**

B.Tech. (Sixth semester) Mechanical engineering

ME 316 E COMPUTER AIDED DESIGN & MANUFACTURING (Practical)

L	T	P/D	Total
-	-	2	2

Practical: 25Marks
Sessional: 50 marks
Duration of Exam: 03 hours

List of Experiments

Note: Practical will base on course No. ME 308 E.