SCHEME OF STUDIES & EXAMINATION

B.TECH. 2nd year Mechanical Engineering (Auto) -3rd Semester

S. No	Subject Name	Code	Teaching Schedule				Examination Schedule (Marks)			Total Marks
			L	T	P	Total		Theory	Practical	
1	Basics of Industrial Sociology, Economics & Management / Mathematics-III	HUM-201 E/ MATH-201E	3	1	-	4	50	100	-	150
2	Thermodynamics	ME-201 E	3	1	-	4	50	100	-	150
3	Strength of Materials-I	ME-203 E	3	1	-	4	50	100	-	150
4	Machine Drawing	ME-205 E	2	-	4	6	50	100	-	150
5	Kinematics of Machine	ME-207 E	3	1	-	4	50	100	-	150
6	Production Technology	ME-209 E	3	1	-	4	50	100	-	150
7	Kinematics of Machine Lab	ME-211 E	-	-	3	3	50	-	50	100
8	Thermodynamics Lab	ME-213 E	-	-	3	3	50		25	75
9	Strength of Materials Lab	ME-215 E	-	-	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-205E for which it is 4 hrs.

MECHANICAL ENGINNERING (AUTO)

B.TECH 4TH SEMESTER

(SCHEME OF STUDIES & EXAMINATION)

S. No	Subjects Name	Code	Teaching Schedule (Hrs)				Examination Schedule (Marks)			Total Marks
			L	T	P/D	Total	Sessional	Theory	Practical/ viva-voce	
1	Automotive Technology	MEA 202 E	3	1	-	4	50	100	-	150
2	Hydraulic and Pneumatic system	MEA 204 E	3	1	-	4	50	100	-	150
3	Automotive Materials and Metallurgy	MEA-206 E	4	-	-	4	50	100	-	150
4	Strength of Materials – II	ME-206 E	3	1	-	4	50	100	-	150
5	Dynamics of Machine	ME-210 E	3	1	-	4	50	100	-	150
6	Motor Vehicle Technology	MEA-212E	3	1	-	4	50	100	-	150
7	Motor Vehicle Technology Lab	MEA-214E	-	-	3	3	50	-	50	100
8	Dynamics of Machine lab	ME-216 E	-	-	3	3	25	-	25	50
9	Automotive Technology lab	MEA-218 E	-	-	3	3	25	-	25	50
10	Automotive Materials and Metallurgy Lab	MEA-220 E	-	-	2	2	25		25	50
	TOTAL		19	5	11	35	425	600	125	1150

MECHANICAL ENGINNERING (AUTO)

B.TECH 5TH SEMESTER

(SCHEME OF EXAMINATION)

S. No	Subjects Name	Code	Teaching Schedule (Hrs)				Examination Schedule (Marks)			Total Marks
			L	T	P/D	Total	Sessional	Theory	Practical/ viva-voce	
1	Microprocessors and Applications	MEA-301 E	3	1	- -	4	50	100	-	150
2	I.C Engine and Gas Turbine	ME-301 E	3	1	-	4	50	100	-	150
3	Numerical Analysis and Programming	MEA-303 E	3	1	-	4	50	100	-	150
4	Heat Transfer	ME-305 E	3	1	-	4	50	100	-	150
5	Machine Design-I	ME-309 E	2		5	7	50	100	-	150
6	Steam Generation And Power	ME-311 E	3	1	-	4	25	100	-	125
7	Thermal Engineering Lab	ME-313 E	-	-	2	2	25	-	25	50
8	Programming Pr. (Numerical Analysis)	MEA-315 E	-	-	2	2	25	-	25	50
9	Heat Transfer Lab	ME-317 E	-	-	2	2	25	-	25	50
10	Machine Design-1 (Viva-Voca)	ME-321 E	-	-	-	-	-	-	25	25
11	Vocational Training	ME-323 E	-	-	-	-	50	-	-	50
	TOTAL		17	5	11	33	350	600	100	1250

MECHANICAL ENGINNERING (AUTO)

B.TECH 6TH SEMESTER

(SCHEME OF EXAMINATION)

S. No	Subjects Name	Code	Teaching Schedule (Hrs)				Examination Schedule (Marks)			Total Marks
			L	T	P/D	Total	Sessional	Theory	Practical/ viva-voce	
1	Refrigeration and Air Conditioning	ME 302 E	3	1	- -	4	50	100	-	150
2	Mechanical Vibration	ME 306 E	3	1	-	4	50	100	-	150
3	Fundamentals of Management	HUT-302E	3	1	-	4	50	100	-	150
4	Computer Aided Design and Manufacturing	ME 308 E	4	-	-	4	50	100	-	150
5	Machine Design-II	ME 310 E	2		6	8	50	100	-	150
6	IC Engines, Emissions And Pollution Control	MEA 312E	3	1	-	4	50	100	-	150
7	Refrigeration and Air Conditioning Pr.	ME 312 E	-	-	2	2	25	-	25	50
8	Tribology & Mechanical Vibration lab	ME-314E	-	-	2	2	50	-	25	75
9	Computer Aided Design and Manufacturing lab	ME 316 E		-	2	2	50	-	25	75
10	Machine Design-II (viva –voce)	ME 318 E	-	-	-	-	-	-	50	50
	TOTAL		18	4	12	34	425	600	125	1150

MECHANICAL ENGINNERING(AUTO)

B.TECH 7TH SEMESTER

(SCHEME OF EXAMINATION)

S. No	Subjects Name	Code	Teaching Schedule (Hrs)				Examination Schedule (Marks)			Total Marks
			L	T	P/D	Total	Sessional	Theory	Practical/ viva-voce	
1	Automotive Chassis & Components	MEA-401E	4	1	- -	5	50	100	-	150
2	Automotive Electricals & Systems	MEA 403 E	3	1	-	4	50	100	-	150
3	Statistical Quality Control and Reliability	ME 405 E	3	1	-	4	50	100	-	150
4	Automotive Transmissions	MEA 407 E	4	1	-	5	50	100	-	150
5	Maintenance Engineering	ME 437 E	4	1	-	5	50	100	-	150
6	Project-1	ME 409E	-	-	7	7	100	-	100	200
7	Automotive Transmissions Lab	MEA 411E		-	2	2	25	-	25	50
8	In plant training report	ME 413 E	-	-	-	-	125	-	-	125
9	Automotive Chassis Lab	MEA-415E	-	-	2	2	50	-	50	100
10	Automotive Electricals & Systems Lab	MEA- 417E			2	2	25		25	50
	TOTAL		1 8	5	13	36	575	500	200	1250

MECHANICAL ENGINNERING (AUTO)

B.TECH 8TH SEMESTER

(SCHEME OF EXAMINATION)

S. No	Subjects Name	Code	Teaching Schedule (Hrs)				Examination Schedule (Marks)			Total Marks
			L	T	P/D	Total	Sessional	Theory	Practical/ viva-voce	
1	Entrepreneurship	ME 402 E	3	1	-	4	50	100	-	150
2	Power Plant Engineering	ME 404 E	4	1	-	5	50	100	-	150
3	Operation Research	ME 406 E	3	1	-	4	50	100	-	150
4	Automotive Electronics & Microcontrollers	MEA 408 E	4	1	-	5	50	100	-	150
5	Computational Fluid Dynamics	ME 441 E	3	1	-	4	50	100	-	150
6	Entrepreneurship (PR)	ME 408 E	-	-	2	2	50	-	25	75
7	Project –II	ME 410 E	-	-	9	9	100	-	100	200
8	Seminar	ME 411 E	2	-	-	2	25	-	-	25
9	Comprehensive Viva - Voce	ME 412 E	-	-	-	-	50	-	-	50
10	General Fitness & Professional Aptitude	ME 414 E	-	-	-	-	-	-	75	75
	TOTAL		19	5	11	35	475	500	200	1175

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.

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

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.

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

B. Tech. (Third semester)
Mechanical engineering(Auto)

THERMODYNAMICS
ME- 201 E

L	T	P
3	1	-

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

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

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, Quasi-static, 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 1^{st} law of Thermodynamics, Internal Energy and Enthalpy, 1^{st} 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 transfer – G F C Rogers and Maghew Y R Longman

B. Tech. (Third semester) Mechanical engineering (Auto)
STRENGTH OF MATERIALS –I
ME- 203 E

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

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

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

B. Tech. (Third semester)
Mechanical engineering (Auto)

MACHINE DRAWING
ME- 205 E

L	T	P		
2	-	4	Theory	: 100 Marks
			Sessional	: 50 Marks
			Total	: 150 Marks
			Duration of Exam	: 5 hrs.

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.

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.

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.
3. Machine drawing : R B Gupta Satya Prakashan

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

B. Tech. (Third semester)
Mechanical engineering (Auto)

KINEMATICS OF MACHINES
ME 207 E

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

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

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 0f 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.

B. Tech. (Third semester)
Mechanical engineering (Auto)

PRODUCTION TECHNOLOGY
ME-209 E

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

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

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

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 (Auto)

KINEMATICS OF MACHINES (LAB.)

ME 211 E

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 (Auto)

THERMODYNAMICS (LAB.)
ME-213 E

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 (Auto)
STRENGTH OF MATERIALS LAB
ME- 215 E

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 (Auto)
AUTOMOTIVE TECHNOLOGY
MEA- 202 E

L	T	P
3	1	-

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

UNIT-I

BRAKING SYSTEM: Fundamentals, frictional forces, braking terms - stopping distance, braking efficiency, brake fade, weight transfer, brake torque, work done. Safe deceleration, road adhesion, Forces acting on vehicle when on a level road, while cornering; Calculation of normal Reaction when all wheels are braked; Numerical;

Principle, construction working of Parking brakes, Hydraulic brakes, pneumatic brakes, compressed air brakes, air hydraulic brakes, Drum brakes -Principle, leading and trailing shoes twin leading shoes; Hydraulic brakes - brakes shoes, brake lining, brake drums, back plate; Conventional and tandem master cylinder, wheel cylinder, component parts and working; Disc brakes: Types swinging ; sliding caliper, two and four cylinder caliper, principle, double disc; Construction and working; Advantages over drum brakes; Properties of friction lining & pad material, hydraulic brake oil; Procedure for bleeding of brakes, trouble and diagnosis; Electronic ABS system - Layout, working details.

UNIT-II

SUSPENSION SYSTEM: Vehicle dynamics and suspension system Requirements. Springs -types, coil, leaf, torsion bar, rubber and pneumatic; Laminated - classification, fully elliptic, Semi-elliptic, transverse, three quarter, elliptic. Design features - grading, nipping, Constant and variable rating, cambering, uniform stress distribution, inter leaf inserts; Types: Conventional and independent suspension system: component parts and working details; Shackles, rubber bushes, metal bushes, advantages of coil springs; Torsion bar suspension system, Hydro elastic suspension, Air suspension : component parts and working; Design of laminated springs; Numericals; Hydraulic dampers: Shock Absorbers : construction and working details; Mc -Phearson strut, Independent rear suspension, Suspension Service.

UNIT-III

FRONT AXLE AND STEERING SYSTEM: Frontaxles : types, Elliot and Lemoine, Hub assembly, calculation of bearing loads; Numericals; Front wheel alignment - Need caster, camber, KPI, toe -in, toe-out adjustments; Centre-point steering; Steering mechanism - Ackermann & Davis; Condition for true rolling; Over steer, under steer, slip angle; Turning circle radius; Steering systems: Function and requirements; Steering linkages, steering components - column, steering gearbox: rack and pinion, re-circulating ball, Cam and peg, Worm and roller, worm and sector : Construction and working details; Power steering : Hydraulic and electronic- working and component parts details; Four wheel steering; Effects of wrong steering geometry on tyres

.**TWO AND THREE WHEELED VEHICLES**: Idea of two and four stroke SI, CI and CNG engines used in two and three wheelers. Component parts and working of: fuel system : Mikuni and zenith carburetors; lubrication system; cooling system; magnetic coil; capacitive discharge ignition (CDI) system, AC generator; clutch system; transmission system; starting system : kick and battery; drive train systems; Engine tuning data; Frames : types; backbone, tubular and double cradle type; Component parts of brake, suspension and steering systems; Panel meters and controls on handle bar, connection of brake, clutch and accelerator cables.

UNIT-IV

AUTOMOTIVE SAFETY: Types of automotive body work-monologue, semi-monocoque tube frame, space frame. Body design for safety, engine location, concept of crumple zone, safety sandwich construction; Definitions: Front floor side, reinforcement C-pillar, seat cross beam, acoustical cross beam, Body style : Sedan, Hard top, coupe and limousine. Roadster, convertible and cabriolet, Station wagon, hatch back; Collapsible steering column, tilt able steering, seat adjustment, collision warning device, air bags (SRS) circuit, head lamps, fog lamps, speedometer, odometer, GPS, seat belt system; Auto Safety and Crash Testing: NCAP (New Car assessment rating), Frontal: Impact tests, offset, side impact, roll-over, roadside hardware, old Vs new full width frontal tests, Head restraints rating.

MODERN FUEL INJECTION TECHNOLOGY: Gasoline MPFI and diesel CRDI systems; Petrol and diesel engine emission norms - EURO V and BS - III, Construction and function of : ECM, ALDL, CALPAK, manifold vacuum sensor, oxygen sensor, VSS, TBI, TPS, MAF, CTS, MAP, ECM input and output diagram; Computer controlled carburetor systems : Air fuel ratio control, throttle body injection systems, idle air control (IAC) motor, injectors; Fuel system components, operation. Electronic diesel injection pump and control system, Pressure valve and injection lines. Injection nozzles, glow plug circuits.

TEXT BOOK

Kohli, P. L., "Automotive Chassis & Body". Tata McGraw Hill, 1987

REFERENCE BOOK

Sethi, H. M., "Automotive Technology", Tata McGraw Hill, 2003

B. Tech. (Fourth semester) Mechanical (Auto)

HYDRAULIC & PNEUMATIC SYSTEMS

MEA-204 E

L	T	P
3	1	-

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

UNIT-I

BASIC CONCEPT AND PROPERTIES:Fluids, distinction between solid and fluid: units and Dimensions: Properties of fluids: density, specific weight, specific volume, specific gravity, temperature, viscosity, compressibility, vapour pressure, capillary and surface tension - Fluid statics: concept of fluid static pressure, absolute and gauge pressure measurements by manometers and pressure gauges, problems.

FLUID KINEMATICS AND FLUID DYNAMICS: Fluid Kinematics : Flow visualization, lines of flow, types of flow -velocity field and acceleration, continuity equation (one and three dimensional differential forms) : Equation of streamline, stream function : velocity potential function, circulation, flow net, equations of motion- Euler's equation along a streamline, Problems.

UNIT-II

DIMENSIONAL ANALYSIS: Dimensional numbers, their application, Buckingham's π theorem, applications, similarity laws and models numerical problems.

INCOMPRESSIBLE FLUID FLOW: Viscous flow, Navier Stoke's equation (statement only) :Shear stress, pressure gradient relationship laminar flow between parallel plates ; Laminar flow through circular tubes (Hagen Poiseulle's), Hydraulic and energy gradient ; flow through pipes, Darcy-Weisback's equation, pipe roughness, friction factor, Mody's diagram, minor losses, flow through pipes in series and in parallel, power transmission,

UNIT-III

HYDRAULIC TURBINES: Impact of jet on flat, curved and moving plates, Fluid machines, definition and classification, exchange of energy, Euler's equation for turbo machines, Construction of velocity vector diagram's, head and specific work, component of energy transfer, degree of reaction, performance curves.

HYDRAULIC PUMPS: Pumps, definition and classifications, Centrifugal pump: classifications, working principles, velocity triangles, specific speed, efficiency and performance curves; reciprocating pump: classification, working principles, indicator diagram, work saved by air vessels and performance curves; cavitations in pumps rotary pumps: working principles of gear and vane pumps.

UNIT-IV

COMPRESSOR AND FANS: Definition, Classification difference, efficiency, performance curves special application in Auto mobile Industries, working and construction of reciprocating, volumetric efficiency, performance curves, inter-cooling, two stage compression optimum inter-cooling pressure, applications of compressors and fans in automobile industry.

B. Tech. (Fourth semester) Mechanical engineering(Auto)
AUTOMOTIVE MATERIALS
AND METALLURGY
MEA-206 E

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

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

UNIT I

Atomic structure of metals & crystal system, crystallographic notation of atomic planes, polymorphism and allotropy, solidification of crystallization (i) nuclear formation (crystal growth) (ii) crystal imperfection Elementary treatment of theories of plastic deformation, phenomenon of slip twinning, dislocation, identification of crystallographic possible slip planes and direction in FCC, BCC, C.P., recovery, re-crystallization, preferred orientation causes and effects on the property of metals.

UNIT 11.

General principles of phase transformation in alloys, phase rule and equilibrium diagrams, Equilibrium diagrams of (i) Binary system in which the components form a mechanical mixture of crystals in the solid state and are completely mutually soluble in both liquid state. (ii) systems whose components have complete mutual solubility in the liquid state and limited solubility in the solid state in which the solid state solubility deceases with temperature(iii) alloys whose components have complete mutual solubility in the liquid state and limited solubility in solid state (iv) system whose components are subject to allotropic change. Iron carbon equilibrium diagram and their Phase transformation

UNIT III

Engineering materials and their properties, classification. Classification of ferrous and non-ferrous materials. Classification of cast iron-properties and their applications. Effects of alloying elements on properties of steel, carbon steel, low alloy steels, stainless steel, tool steels and die steels. Alloys of Ni, Al, Cu, Mg; properties and their applications. Classification of composite materials and their properties and applications.

Heat treatment and surface treatment: Heat treatment of steel – Annealing, Normalising, Hardening and tempering with their types and application to automotive components, surface hardening techniques, Induction, flame and chemical hardening, coating of wear and corrosion resistance, Electroplating. Phosphating, Anodizing, hot dipping, thermal spraying, hard facing and thin film coatings.

UNIT IV.

Selection of materials: Cryogenic wear, corrosion, fatigue, creep and oxidation resistance application. criteria of selecting materials for automotive components viz cylinder block, Cylinder head, piston, piston ring, Gudgeon pin, connecting rod, crank shaft, crank case, cam, cam shaft, engine valve, gear wheel, clutch plate, axle, bearings, chassis, spring, body panel - radiator, brake lining etc.Application of non-metallic materials such as composite, ceramic and polymers in automobile.

References:

1. Khanna.O.P., " Material Science and Metallurgy ", Dhanapal Rai & Sons,
2. Kapoor, " Material Science and Processes ", New India Publishing House,
3. Raghavan.V., Physical Metallurgy, Principle and Practice, Prentice Hall,
4. Bawa.H.S., Materials Metallurgy, McGraw-Hill,.
5. Avner S.H". Introduction to Physical Metallurgy" McGraw-Hill, New York,
6. Dieter, G.E., Mechanical Metallurgy, McGraw-Hill, New York, 1996.
7. Heat treatment of metals B. Zakharv

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

L	T	P
3	1	-

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

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

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 :.

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.

B. Tech. (Fourth semester) Mechanical engineering(Auto)
DYNAMICS OF MACHINES
ME –210 E

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

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

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.

B. Tech. (Fourth semester) Mechanical engineering (Auto)
MOTOR VEHICLE TECHNOLOGY

MEA-212 E

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

UNIT-I

I.C ENGINES (INTRODUCTION):
Working and difference between SI and CI Engines, Two and four stroke cycles, Theoretical heat cycles, ideal and actual Otto and diesel cycle, mixed cycle; Numerical, Working of two and four stroke SI and CI engines, Scavenging methods of two-stroke petrol engines, Comparison of two and four stroke cycle engines, Auto engines classifications-arrangement of cylinders, valves and camshaft, Types of fuels used, engine speed, methods of cooling, engine balance, Principle of combustion, detonation and pre-ignition-differences, Valve timing diagrams - SI and CI, two and four stroke engines.

ENGINE PERFORMANCE: Bore and stroke, swept and clearance volume, compression ratio, effect of C.R, engine torque, mean effective, bmep, bhp, Ihp, fhp, Engine efficiencies - air standard, mechanical, thermal, indicated thermal, brake thermal, volumetric, requirements of high volumetric efficiency, Factors.; Specific fuel consumption, Numerical

UNIT-II

ENGINE COMPONENT PARTS: Cylinder block Types, Crankcase, liners: wet and dry, Gaskets, Timing covers, oil pan, cylinder head; SI engines combustion chambers: types and comparison, CI engine combustion chambers: Direct and Indirect injection, Intake & exhaust ports, lubricating passages, Intake & Exhaust valves and mechanisms, Camshafts, Side & overhead, advantages and disadvantages, Valve seat and conical angles, Valve seat insert, Valve springs, locks, Rocker-shaft, rocker arm, push rod, Cam followers-types, Timing of valves, Intake and exhaust manifold, Mufflers-types, Crankshaft :Nomenclature; Flywheel-functions; Oil seals; Engine Bearings : Thrust, ball, taper roller, needle, split, journal; Bearing materials, properties; Connecting rod; Piston : function, types, materials, piston rings: types, design details, Piston Pins, Component material chart :All engine components.

CHASSIS AND BODY: Types - unitized and separate body and chassis, Advantages, Designs: chassis frame; Chassis side and cross member, sections and joints; Body: requirements, main parts, Material composition, Body shape-aerodynamic design, CD for different types of vehicles; Vehicle component's attachments, Front and Rear wheel drive component locations: advantages and disadvantages; Rear mounted engine and rear wheel drive : advantages; Definitions : wheel base, wheel track, minimum radius, front and rear overhang, ground clearance, gradeability, laden and unladen weight; Car seat and seat belt mounting and adjustment.

UNIT-III

CLUTCH SYSTEM: Principle, requirements, operation, components of conventional single plate clutch, diaphragm clutch, multiple plate wet clutch, centrifugal clutch; Fluid coupling-characteristics, principle, velocity diagrams, efficiency and torque capacity curves; Comparison of conventional and diaphragm clutch and fluid coupling. Clutch operating systems: rod, cable, hydraulic; Clutch Plate: requirements, construction, material, linings : required properties, types; Numerical; Clutch faults and diagnosis, Clutch pedal free play.

REAR AXLES AND TYRES: Axle Casing, types, rear axle shafts - stresses and load taken, semi floating, ¾ floating and fully floating; Comparative data : axles; Automobile wheel :loads, torques and stresses, types of wheels, requirements, specifications, Types of rims, Advantages of smaller wheels; Requirement of tyres. Types : conventional, radial and tubeless, Inner tubes; Merits of tubeless tyres over pneumatic tyres; Pneumatic tyres: constructional details: plies, tread designs, characteristics, aspect ratio, inflation pressure : comfort, braking, cornering, cost, fuel consumption, tyre materials; Tyre specifications; Points to increase tyre life : load, vehicle handling, speed, wheel balancing, tyre rotation, wheel alignment Procedure: Tyre retreading.

UNIT-IV

GEAR BOX, PROPELLER SHAFT AND DIFFERENTIAL: Necessity of gearbox, types of gear wheels, function, construction and working details of sliding mesh, constant mesh, synchromesh and epicyclic gearbox: application and advantages; Overdrive, torque converter: principle and performance curves; Automatic gearbox; Gear selector mechanisms, synchronizing rings : materials and construction, Continuously variable transmission(CVT), Numericals, Gear box lubrication, Grade of oil, topping : up procedure, leakage prevention : static and dynamic seals; Final drive :Hotch Kiss and Torque tube; Propeller shaft : requirement, construction, maintenance, critical speed vibration, double propeller shaft, Maruti half shafts; Universal Joints : types, rubber doughnut, hookes, constant velocity (Birfield), speed variation of hookes coupling, coupling with driven shaft; Numericals, Differential: requirements, principle, construction and working; Bevel gears, hypoid gear, worm and warm wheel, Differential lock, limited slip differential, double reduction. Numericals

TEXT BOOK: Crouse, W.H, “Automobile Technology”, Tata Mc Graw Hill

REFERENCE BOOKS

Sethi, H. M, “Automotive Technology”, Tata McGraw Hill, 2003
Gupta R. B, “Automobile Engineering”, Dhanpat Rai & Sons, 1998

B. Tech. (Fourth semester) Mechanical engineering (Auto)
MOTOR VEHICLE TECHNOLOGY LAB
MEA-214 E

L	T	P		
-	-	3	Class Work	: 50 Marks
			Exam	: 50 Marks

List of Experiments

1. Identify, write specifications and draw sketches of
   i) General Tools
   ii) Measuring Tools
   iii) Special Tools used in an automobile workshop and Practice to use them.
2. Identify various assemblies and sub assemblies of an automobile chassis. Draw layout an Explain function of each unit.
3 Study of 4 stroke C.I and S.I engines. Draw Sketches and explain the function of each Component.
4. Study of 2 stroke S.I engine. Draw Sketch and explain the function of each component.
5. Study the Cooling System of an Automotive Engine sketch the various components and explain function of each.
6. Identification of components of single plate, multi plate clutch system. Draw sketch and explain function of each component.
7. Identifications of components of sliding mesh constant mesh and synchromesh gear box. Draw power flow diagrams at various speeds.
8. Identify and give functions of each component of differential and rear axle assembly.
9. Study construction of different types of Automobile wheels and tyres and draw their Sketches.
10. Study the propeller Shaft, Slip joint and universal Joints of a Vehicle. Draw sketches and Label various components parts.

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 (Auto)

DYNAMICS OF MACHINE (LAB.)
ME 216E

L	T	P		
-	-	3	Sessional	: 25 Marks
			Practical/Viva	: 25 Marks
			Total	: 50 Marks

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 corolis component of acceleration and compare with theoretical values.

Note: 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(Auto)
AUTOMOTIVE TECHNOLOGY (LAB.)
MEA-218E

L	T	P		
-	-	3	Sessional	: 25 Marks
			Practical/Viva	: 25 Marks
			Total	: 50 Marks

LIST OF EXPERIMENTS

1. Study and function of each component of Drum,Disc, Girling Multiplate Disc and ABS brake system.
2. Study of mechanical, hydraulic and pneumatic brake system.
3. Identification and function of each component of front and rear Suspension System.
4. Study of manual and power assisted steering mechanism.
5. Evaluate steering systems and steering linkage geometry.
6. Study and function of each component of different types of front axles with hub.
7. Layout of A.C system of a car. Identify and give functions of its each unit.
8. Study of 3-wheeler chassis frame and powertransmission system and comparison of their various parameters.
9. Study the carburetor of motor cycle/ scooter. Set mixture screw for idle running
10. Study motor cycle drive train system and adjust
    (a). Clutch play
    (b). Gears Play
    (c). Front & rear brakes
11. Study capacitive discharge ignition system for engine of a motor cycle/scooter.
12. Study of MPFI System for a gasoline engines along with sensors and catalytic converter.
13. Study of diesel injection system, reciprocating F.I.P, rotary pumps and injectors used in TDI and CRDI system

Note: 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 (Auto)

AUTOMOTIVE MATERIALS AND METALLURGY LAB

MEA-220E

L	T	P		
-	-	2	Sessional	: 25 Marks
			Practical/Viva	: 25 Marks
			Total	: 50 Marks

1. Study of different Engineering materials and their mechanical properties.
2. To study the microstructures of the following materials i) Hypo Eutectoid & Hyper Eutectoid steels.
ii) Hypoeutectic cast iron and hyper eutectic cast iron. iii) Grey and white cast iron iv) Non – ferrous metals i.e. Al. Mg. Cu. Ni. Son. And their alloys.
3. Study of iron carbon diagram and its engineering applications.
4. Annealing of steel, effect of annealing temperatures and time on hardness.
5. Study of microstructure and hardness of steel at different rates of cooling.
6. Hardening of steel, effect of quenching minimum and agitation of the medium on hardness.
7. Effect of carbon percentage on the hardness of steel.
8. Hardenability test by Jominy's End quench test.
9. Normalizing tempering of steel components.
10. To study the case hardening processes i.e. carburizing, Nitriding, cyaninding etc.
11. To study and construct the T-T- T diagram for steels

B. Tech. (Fifth semester) Mechanical Engineering(Auto)

Microprocessors and Applications
MEA 301 E

L	T	P/D	Total
3	1	-	4

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

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

UNIT - I

Introduction To Microprocessors And Microcontrollers: Introduction to Microprocessors and Microcontrollers, Number Systems and Binary arithmetic, Microprocessor Architecture (8085 and 8086) and Microcomputer Systems, memory map and addressing, memory classification, review of logic device for interfacing, Memory Interfacing, Overview of 8085 Instruction Set, stacks and Interrupts.

UNIT - II

The 8051 Architecture:8051 Microcontroller hardware, oscillator and clock, Prog. Counter and Data Pointer, Registers and Program Status word, Internal Memory RAM, Stack and Stack Pointer, Special Function Registers, Internal ROM. Input / Output Pins, Ports and Circuits, External Memory, Counters and Timers, Serial Data Input and Output, Interrupts.

UNIT - III

Assembly Language & Programming The 8051: Assembly Language programming, Programming the 8051, Moving Data, Logical Operations, Arithmetic Operations, Branching Operations, Interrupts.

UNIT - IV

Microcontroller 8051 design: Microcontroller specification and Design, External Memory and Memory space decoding, Memory – mapped I/O, Memory Access times, Timing Subroutines, Lookup Tables for 8051, Serial Data Transmission.

Interfacing Peripheral Devices To 8051 And Applications: Interfacing A/D Converters and D/A Converters, 8255, 8259. Application to interfacing Scanned Displays, Matrix Keyboard, Memory Design, Data Acquisition System Design.

Text Books:

1. K.J. Ayala, “The 8051 Microcontroller, Architecture, Programming & Applications”, Thomsom Delmer Learning.

2. RS Gaonkar, “Microprocessors Architecture, Programming and Applications”, Penram International.

Reference Books:

1. M.A. Mazidi. & J.G Mazidi, “The 8051 Microcontroller & Embedded Systems”, Pearson Education.

2. B.Ram, “Fundamentals of Microprocessors and Microcomputers”, Dhanpat Rai and Sons.

B. Tech. (Fifth semester) Mechanical Engineering(Auto)
I.C.ENGINE AND GAS TURBINES
ME 301 E

L	T	P/D	Total
3	1	-	4

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

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

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(Auto)

Numerical Analysis and Programming

MEA 303 E

L	T	P/D	Total	
3	1	-	4	

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

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

UNIT - I

Numerical Techniques: The solution of linear and non-linear equations: Direct Iteration method, Regula-Falsi method, Newton – Raphson method. Solution of system of simultaneous equations by Gauss elimination, Gauss-Jacobi and Gauss-Seidal methods.

Finite differences: Forward, backward and Central differences.

UNIT II

Interpolation and Numerical Calculus: Newton's interpolation for equi-spaced values. Divided differences and interpolation formula in terms of divided differences. Stirling's central difference interpolation formula, Lagrange's interpolation formula for unequi-spaced values. Numerical Differentiation. Numerical Integration: Newton-Cote's quadrature formula, Trapezoidal rule, Simpson's one-third rule and Simpson's three-eighth rule.

UNIT III

Numerical solution of ordinary differential equations: Picard's method, Euler's method, modified Euler's method, Runge-Kutta method of fourth order, Milne's predictor-corrector method.

UNIT IV

Computer Programming: Writing programmes in C++ for solving numerical problems. For example, Programme for solving algebraic and transcendental equations by Newton-Rapson Method, solving simultaneous equations by Gauss-Seidal method. Programme for Interpolation by Lagrange's method. Programme for estimating the value an integral by Simpson's rule. Programme for solving differential equation by Runge-Kutta method, etc.

Text Books:

1. V.P. Mishra; “Text Book of Engineering Mathematics”, Galgotia Publications, Delhi.

2. B.S. Grewal, “Higher Engineering Mathematics”, Khanna Publications, Delhi.

3. V.P. Jaggi and A.B. Mathur, “Advanced Engineer Mathematics”, Khanna Publications, Delhi.

Reference Books:

1. S.S. Sastry, “Introductory Methods of Numerical Analysis”, Prentice Hall of India Pvt. Ltd., New Delhi.

2. M.K. Jain, S.R.K Iyengar, R.K. Jain, “Numerical Methods for Scientific and Engineering Computation”, New Age International Publishers, New Delhi.

B. Tech. (Fifth semester) Mechanical Engineering(Auto)

HEAT - TRANSFER

ME 305 E

L	T	P/D	Total	
3	1	-	4	

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

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

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

B. Tech. (Fifth semester) Mechanical Engineering(Auto)
Machine Design- 1
ME 309 E

L	T	P/D	Total
2	-	5	7

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

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

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 by 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

B. Tech. (Fifth semester) Mechanical Engineering(Auto)
STEAM GENERATION & POWER
ME 311 E

L	T	P/D	Total
3	1	-	4

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

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

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.
Advantage 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

B. Tech. (Fifth semester) Mechanical Engineering(Auto)
Thermal Engineering (Practical)
ME 313 E

L	T	P/D	Total	
-	-	2	2	

Theory: 25 Marks
Sessional: 25 marks

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 (I) the Fuel Injection System of a C. I. Engine. (II) 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 (Auto)
Programming-I (Numerical Analysis)

MEA 315 E

L	T	P/D	Total
-	-	2	2

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

Based on Course work MEA 303E

B. Tech. (Fifth semester) Mechanical Engineering (Auto)

Heat Transfer (Practical)

ME 317 E

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. (Sixth semester) Mechanical Engineering (Auto)

Refrigeration and Air-Conditioning

ME 302 E

L	T	P/D	Total	
3	1	-	4	

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

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

(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

1. Refrigeration and air-conditioning by C.P arora
2. Basic Refrigeration and air-conditioning by Annanthana and Rayanan, TMG
3. Refrigeration and air-conditioning BY Arora and Domkundwar, Dhanpat rai

B. Tech. (Sixth semester) Mechanical Engineering (Auto)

MECHANICAL VIBRATION

ME 306 E

L	T	P/D	Total	
3	1	-	4	

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

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

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

B. Tech. (Sixth semester) Mechanical Engineering(Auto)
FUNDAMENTALS OF MANAGEMENT
HUT-302E

L	T
3	1

Theory : 100 Marks
Sessional : 50 Marks
Total : 150 Marks
Time : 3 hours

NOTE: The question paper shall have eight questions in all organized into four sections, each section having two questions from each of the four units. The candidate shall have to attempt five questions in all , selecting at least one question from each unit.

UNIT-I **Financial Management**

Introduction of Financial Management, Objectives of Financial Decisions, Status and duties of Financial Executives. Financial Planning – Tools of financial planning. Management of working capital, Factors affecting requirements of working capital. Capital structure decisions. Features of appropriate capital structure. Sources of finance.

UNIT-II **Personnel Management**

Personnel Management – Meaning, Nature and Importance; Functions of Personnel Management – (a) Managerial Functions and (b) Operative functions. Job Analysis: Meaning and Importance; Process of Job Analysis; Job Description and Job specification. Human Resource Development-Meaning and concept.

UNIT-III **Production Management**

Production Management : Definition and Objectives
Plant location: Ideal plant location. Factors affecting plant location.
Plant Layout : Ideal plant layout, factors affecting plant layout.
Work Measurement : Meaning, Objectives and Essentials of work measurement.
Production Control : Meaning and importance of production control and steps involved in production control.

UNIT-IV **Marketing Management**

Nature, scope and importance of marketing management. Modern Marketing concepts. Role of marketing in economic development. Marketing Mix. Marketing Information System. Meaning, nature and scope of International Marketing.

B. Tech. (Sixth Semester) Mechanical Engineering (Auto)
Computer Aided Design And Manufacturing
ME 308 E

L	T	P/D	Total	
4		-	4	

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

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

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

B. Tech. (Sixth Semester) Mechanical Engineering(Auto)

MACHINE DESIGN II

ME 310 E

L	T	P/D	Total	
2	-	6	8	

Theory: 100Marks
Sessional: 50 marks
Duration of Exam: 04 hours

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

UNIT I

Classification of Gears; Selection of type; Law of Gearing, Standard system of Gear tooth, Various Failure 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 Approach Robert l Norton, prentice hall

Fundamental of machine component design R.C Juvinnal, Johan wiley& sons

B. Tech. (Sixth Semester) Mechanical Engineering(Auto)
IC Engines, Emissions And Pollution Control
MEA 312 E

L	T	P/D	Total	
3	1		4	

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

UNIT - I

I.C. Engines: Working of Two stroke and Four stroke SI and CI Engines. Valve Timings. Actual indicated diagrams. Combustion calculations. Carburetion and Fuel Injection. Supercharging. Lubrication and cooling methods. Governing methods. Engines performance & Testing.

Combustion in S.I. and C.I. Engines: Normal & Abnormal Combustion. Pre-ignition. Detonation. Knocking. Comparison of knocking in S.I. and C.I. Engines. Rating of Fuels.

UNIT - II

Engine Fuels: Types of Hydrocarbon, Gasoline, Diesel specifications, Alternate Fuels – Properties of CNG, LPG, Alcohol, Bio- Fuel as vehicular Fuels.

Emission and Air Pollution: Automotive emissions and their role in air pollution, photochemical smog, Chemistry of smog formation. Combustion in homogeneous mixtures, emission formation, Incomplete combustion. Formation of Hydrocarbons (HC), carbon monoxide and oxides of nitrogen. Aldehyle. Emissions of unregulated toxic pollutants such as benzene; 13butadiene etc. Influence of engine design and operating parameters on S.I. engine exhaust emissions.

Hydrocarbon Evaporation Emissions: Various sources and method of their control, canisters for controlling evaporative emission control system for S.I. engines, blow-by control closed PCV system, reduction of exhaust emissions, various methods. Fules system design.

UNIT - III

Exhaust Treatment devices: Air injection into exhaust system. Thermal reactors, Catalytic converters- construction, efficiency, effect of equivalence ratio, additives on efficiency of 3-Way converter.; Advances in Converter design, plasma Catalyst

Stratified charged engines. Gasoline Direct injection, Various Methods for stratification;, Honda CVCC engine.

Diesel engine emissions: Source of emissions during combustion, effect of Air injector timing on performance and formation. D.I and I.D.I. engines emissions. Diesel smoke, PM and RSPM emission.

Methods of reducing emission, Exhaust gas re-circulation, smoke emission from diesel engines, Particulate Traps, Continuous Regeneration Traps (CRT). Methods for control of NO_x

UNIT - IV

Emission from CNG and LPG Engines.

Emission Instruments: Non – dispersive infrared analyzer. Gas chromatography. Flame Ionisation Detector. Chemiluminescent analyzer.

Emission Standards: Ambient Air Quality Standards, Mass emission standards, Air pollution cost benefit analysis.

Text Books:

1. R.P. Sharma and M.L. Mathur, "Internal Combustion Engine", Dhanpat Rai Publications

2. V. Ganeshan, "Internal Combustion Engine", Tata McGraw Hill

Reference Books:

1. Angli M Course., "Automotive Engines", CBS Publications

2. Harper, "Fuel Systems Emission Control", CBS Publications

. Tech. (Sixth semester) Mechanical Engineering (Auto)
Refrigeration and Air Conditioning (Practical)
ME 312 E

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

TRIBOLOGY & MECHANICAL VIBRATION (PRACTICAL)

ME 314 E

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 determine the two frequencies of torsional spring type double pendulum & compare them with theoretical values.
8. To determine the radius of gyration of a compound pendulum.
9. To determine the radius of gyration of disc using trifilar suspension.

Note: At least eight experiments should be performed from the above list. Remaining one experiments may either be performed from the above list or outside the list.

B. Tech. (Sixth Semester) Mechanical Engineering(Auto)
COMPUTER AIDED DESIGN & MANUFACTURING (Practical)
ME 316 E

L	T	P/D	Total
-	-	2	2

Practical: 5Marks
Sessional: 50 marks
Duration of Exam: 03 hours

List of Experiments

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

B. Tech. (Sixth semester) Mechanical engineering(Auto)
AUTOMOTIVE CHASSIS AND COMPONENTS

MEA-401E

L	T
4	1

Theory : 100 Marks
Sessional : 50 Marks
Total : 150 Marks
Time : 3 hours

UNIT I

Front Axle & Steering System

Types of front axles. Constructional details. Materials. Front wheel geometry viz. Castor, Camber, King pin inclination,Toe. Wheel Alignment. Cornering force and Side thrust. Steering geometry. Ackerman and Davis steering system. Different types of steering gear boxes. Steering linkages and their layouts. Power and power assisted steering. Steering of crawler tractors. Multi axle steering systems.

Driveline and Differential

Effects of driving thrust and torque reactions. Hotch kiss drive, torque tube drive and radius rods. Transverse rods. Propeller shaft. Universal joints. Constant velocity universal joints. Drive Shaft. Front wheel drive. Different types of final drives. Spiral bevel gear and hypoid gear final drives. Double reduction and twin speed final drives. Differential principles. Constructional details of a differential gear unit. Non-slip and Limited slip differential. Differential locks - Differential housings. Comparison of front wheel, rear wheel and all wheel drive arrangement.

UNIT II

Drive axles

Construction of rear axles. Types of loads acting on rear axles. Fully floating, three quarter floating, and semi floating rear axles. Rear axle housing. Construction of different types of axle housing, multi axled vehicles. Construction details of multi drive axle vehicles. Dead axles.

Suspension system

Need of suspension system, Types of suspension, Suspension springs, Constructional details and characteristics of leaf, coil and torsion bar springs, Independent suspension, Types: Mc Pherson strut, Double wishbone, Five link type, etc, Rubber suspension, Pneumatic suspension, Shock absorbers.

UNIT III

Wheels and Tyres

Types of wheels – wire spoke, disc – solid and split type, alloy type, offset, onset & zero set, denomination of rim. Tyres - construction, structure, denomination and function of tyres, types of tyres, comparison of radial and bias ply tyres. Tubes – construction and types, Tubeless tyres. Tyre inflation, effects of tyre pressure on tyre performance. Tyre wear patterns and their causes. Wheel Balancing – need, procedure.

UNIT IV

Braking system

Weight transfer during braking and stopping distances. Classification of brakes - drum brakes and disc brakes. Constructional details. Theory of braking. Brake split and proportioning. Mechanical, hydraulic and pneumatic brakes - Servo brake, power and power-assisted brakes - Different types of brake retarders like eddy current and hydraulic retarder. Skidding of wheels on braking and remedies
- Anti lock braking systems.

Text Books:

1. Automobile Engineering Vol-1 by Kirpal Singh..

References:

1. Steed W., " Mechanics of Road vehicles ", Illiffe Books Ltd., London.
2. Newton Steeds & Garrot, " Motor vehicles ", Butterworths, London.
3. Judge A.W., " Mechanism of the car ", Chapman and Halls Ltd., London.
4. Giles.J.G., " Steering, Suspension and tyres ", Iliffe Book Co., London.
5. Crouse W.H., " Automotive Chassis and Body ", McGraw Hill. Newyork
6. Heldt P.M., " Automotive chassis ", Chilton Co., New York

B. Tech. (Seventh Semester) Mechanical Engineering(Auto)
AUTOMOTIVE ELECTRICALS & SYSTEMS
MEA 403 E

L	T	P/D	Total
3	1	-	4

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

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

UNIT I

Introduction

Earth returns and insulated return systems, 6, 12, and 24-volt systems. Positive & negative earth systems. Fusing of circuits, relays, switches, low and high voltage automotive cables, wiring diagram for typical automotive wiring systems, maintenance and servicing.

Batteries

Principles of lead acid cells and their characteristics - construction and working of lead acid battery, types of batteries, testing of batteries, effect of temperature on: capacity and voltage, battery capacity, voltage, efficiency, charging of batteries, sulphation and desulphation, maintenance and servicing, Battery failures & checking, Maintenance free Batteries, High energy and power density batteries for electric vehicles.

UNIT II

Charging system

Principle of generation of direct current. Shunt generator characteristics. Armature reaction. Third brush regulation. Cut-out. Voltage & current regulators, compensated voltage regulator. Alternators - principle, constructional and working aspects, bridge rectifiers. Principle of Magneto, Flywheel Magneto, Maintenance and servicing. Trouble shooting in charging systems.

Starting system

Condition at Starting – starting torque and power requirements, behavior of starter during starting. Series motor and its characteristics. Principle & construction of starter motor. Working of different starter drive units, care & maintenance of starter motor. Starter switches. Safety mechanism. Maintenance, servicing and trouble shooting.

UNIT III

Ignition system

Types, construction & working of battery & coil and magneto ignition systems. Relative merits, Ballast Resistor, Ignition coil, Distributor, Contact breaker Point, centrifugal and vacuum advance mechanisms, Limitations of conventional ignition systems, Transistorized Ignition systems, Spark plugs - construction, different types, plug fouling, maintenance, servicing and fault diagnosis, Electronic Ignition system. Programmed ignition, distributor less ignition.

Lighting system

Principle of automobile illumination, headlamp construction and wiring, reflectors – types, signaling devices- flashers, stop lights, fog lamps, auxiliary lighting-engine, passenger, reading lamp. Regn-plate lamps. Automatic illumination system. Head light levelling devices. Study of a modern headlight system with improved night vision.

UNIT IV

Electrical Equipment and Accessories

Oil pressure gauge, fuel level gauge, engine temperature gauge, electrical fuel pump, speedometer, odometer,

trip meter, engine rpm meter, Headlamp & Windshield washer and wiper, heaters and defrosters, horns, stereo/radio, power antennae. Central locking, power window winding. Sun/Moon Roof. Motorized rear view mirrors, reverse warning, Bumper collision warning. Other accessories in modern vehicles.

Fuel cell

Thermodynamic aspects; types-hydrogen and methanol, power rating and performance. Various components and working of fuel cell. Heat dissipation.

Drive Motors and controllers:

Drive arrangements in Hybrid and Electric vehicles. Drive motors: types and construction. Controlling of motor operations. Motor-generator in hybrid vehicles and its controls.

Books

1. "Automotive Electrical Equipment ", P.L. Kohli, Tata McGraw-Hill Co. Ltd. New Delhi, 1975.
2. “Principles of Electricity and electronics for the Automotive Technician”, Chapman, Thomson Asia, 2000.
3. "Modern Electrical Equipment of Automobiles", A.W. Judge. Chapman & Hall, London.
4. "Automobile Electrical and Electronic Equipments ", A.P. Young. & L. Griffiths, English Languages Book Society & New Press, 1990.
5. "Storage Batteries ", G.W. Vinal. John Wiley & Sons Inc., New York, 1985.
6. "Automobile Electrical Equipment ", W.H. Crouse. McGraw Hill Book Co. Inc., New York,
7. "Electrical Ignition Equipment ", F.G. Spreadbury, Constable & Co Ltd., London, 1962.
8. “Basic Automotive Electrical Systems”, C.P.Nakra, Dhanpat Rai
9. Fuel Cells by Bockris and Srinivasan; McGraw Hill
10. Automobile Engineering Vol –II by Kirpal Singh

B. Tech. (Seventh Semester) Mechanical Engineering(Auto)
Statistical Quality Control and Reliability
ME 405 E

L	T	P/D	Total
3	1		4

Theory : 100 marks
Sessional : 50 marks
Duration of Exams. : 03 hours

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

UNIT I

Quality -Basic Concepts: Issues in Quality, factors affecting quality, creating quality by design, product development cycle, economics of quality, Various definitions, ISO definition of quality and its meanings, and various phases till TQM and its meaning to industries, customers and employees, contribution of quality gurus etc. towards quality concepts. Total Quality Management: its scope, application and implementation. Quality Circle: its objectives, structure and techniques. Variability concept in manufacturing-cycle, fishbone diagrams, charts in time philosophy

UNIT II

Basic statistical concepts, various types of distributions, General theory X and R chart. Decision preparatory to the control charts. Trial control limits. Selection of subgroups. Charts with variable subgroups, Reject and Revoke, limits for average on X charts, modified control limits, specification limits, practical limitations. Control charts for fraction defectives, calculation and plotting of control limits, sensitivity of p chart, applications. Control charts for Defects, difference between defect and defective, calculation and plotting of control limits, applications, pi charts and u charts, plotting of charts. Tests of various control charts. Process capability- inherent and potential capability.

UNIT III

Purpose of Acceptance by Attributes, Single sampling plans. O.C. curve, selection of sampling plans, Acceptance number, Type A and Type B, O.C. curves, Double sampling plan and its analysis, Multiple and sequential sampling, A.O.Q.L, Acceptance sampling plans under risk. Design of various sampling plans, Dodge-Roming type system for acceptance sampling by attributes (use of various tables). Determination of process average, Acceptance sampling by variables.

UNIT IV

Control of reliability, factors affecting reliability, pattern of failure, mean time to failure, Fundamental of statistical concepts, consideration of reliability in series and parallel system, effect of redundancy and reliability, method of reliability evaluation, reliability optimization, Availability and Maintainability, means to improve reliability, reliability control during manufacture.

Reference and Text Books:

1. Statistical Quality ControlBy Grant and Leaven, McGraw-Hill
2. Quality Control and ReliabilityBy Mahajan, Dhanpat Rai.
3. Quality Control By Hansen, Prentice- Hall

B. Tech. (Seventh Semester) Mechanical Engineering(Auto)
AUTOMOTIVE TRANSMISSIONS
MEA 407 E

L	T	P/D	Total
4	1		5

Theory : 100 marks
Sessional : 50 marks
Duration of Exams. : 03 hours

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

UNIT I

Introduction

Need for Transmission system. Tractive Effort and Resistances to Motion of a vehicle. Requirements of transmission system. Classification of Transmission systems. Single, Two or Four Wheel drive systems. Multi axle drives. Chain, Shaft and Electric drives. Location of transmission system. Different transmissions in scooter, car, MUVs and transport vehicles of Indian make.

Clutch

Principle of operation, Constructional details, torque capacity and design aspects. Different types of clutches. Operation of single plate: helical spring and diaphragm type, and multiplate clutch. Centrifugal and Automatic Clutch. Dry and Wet type of clutch. Friction lining materials. Over-running clutch. Modes of operating a clutch – mechanical, hydraulic and electric.

UNIT II

Gear box

Determination of gear ratios for vehicles. Performance characteristics in different speeds. Different types of gear boxes – sliding, constant and synchromesh type. Need for double declutching and working of synchronizing unit. Power and economy modes in gearbox. Transfer box. Transaxles. Overdrives. Gear shifting mechanisms – mechanical link and wire types

UNIT III

Hydrodynamic drive

Fluid coupling- principle of operation, constructional details. Torque capacity. Performance characteristics, Reduction of drag torque. Torque converter-Principle of operation, constructional details, performance characteristics, converter coupling, multistage torque converters and Polyphase torque converters.

Hydrostatic drive

Hydrostatic drive - Various types of hydrostatic systems - Principles of hydrostatic drive system, Advantage and limitations, Comparison of hydrostatic drive with hydrodynamic drive - Construction and working of typical Janny hydrostatic drive.

UNIT IV

Electric drive

Electric drive Principle of early and modified Ward Leonard Control system. Advantage & limitations. Performance characteristics. Study of drive system in an electric and hybrid vehicle.

Automatic transmission applications

Chevrolet "Turboglide" Transmission, Powerglide Transmission Toyota "ECT-i" Automatic Transmission with Intelligent Electronic controls system, Hydraulic Actuation system.

References:

1. Heldt.P.M., " Torque converters ", Chilton Book Co.
2. Newton and Steeds, " Motor vehicles ", llliffe Publishers.
3. Judge.A.W., " Modern Transmission systems ", Chapman and Hall Ltd.
4. SAE Transactions 900550 & 930910.
5." Hydrostatic transmissions for vehicle applications", I Mech E Conference,1981-88.
6. Crouse. W.H., Anglin., D.L., " Automotive Transmission and Power Trains construction ", McGraw-Hill.
7. Automobile Engineering Vol-1 by Kirpal Singh.

B. Tech. (Seventh Semester) Mechanical Engineering(Auto)
Maintenance Engineering
ME 437 E

L	T	P/D	Total	
4	1		5	

Theory : 100 marks
Sessional : 50 marks
Duration of Exams. : 03 hours

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

UNIT I

Evolution of maintenance, objective of maintenance, maintenance policies and philosophies, maintenance concept, maintenance management & terotechnology, relationship with other functional areas, importance of maintenance, elements of good maintenance, economics of maintenance, training and safety aspects in maintenance.
Classification of maintenance programs, corrective preventive and predictive maintenance, comparison of maintenance programs, preventive maintenance-concept, functions, benefits, limitations.

UNIT II

Objectives, what to monitor, when to monitor, principles of CBM, condition based maintenance techniques, manual inspections, performance monitoring, vibration monitoring, current monitoring, coil debris/spectroscopy, thermography and corrosion monitoring, steps in implementation of CBM, benefits of CBM.
RCM logic, maintenance and RCM, benefits of RCM, total productive maintenance (TPM), introduction, key supporting elements of TPM, methodology, evaluation and benefits.

UNIT III

Purpose and challenges: Techniques, visual aids-boroscopes, endoscopes, fiber optics scanners, magnetic particles inspection, liquid penetrants, eddy current, ultrasonic radiography, selection of NDT technique, metrits/demerits and applications of various techniques.
Basic ingredients, basic steps in maintenance management, maintenance planning and control system, documentation, maintenance-productivity areas for improvement

UNIT IV

Techniques for improvement of operational reliability, safety and availability of machines and
production systems, maintainability criteria, checklist to assess the maintainability of a system, maintainability programs, objectives, key issues in availability improvements program, fault diagnosis, Pareto principle Ishikawa diagram.
Data processing systems for integrated maintenance, maintenance information and reporting systems.

Text Books:

1. Maintenance Planning and Control by Higgin L.R., McGiaw Hill Book Co1,1900
2. Maintenance Planning and Control by Kelly Anthony, East West Press Private Ltd, New Delhi, 1991.
3. Maintainability principle and practices by Blanchard B.S. and Lowey E.E. McGrawHill Book co.
4. Practical NOT by Raj B. Jaya Kumar T and Thavasimulyi K., Narora Publishing House, New Delhi, 1996.
5. Engineering Maintenance Management by Niebel Benjamin W. Marcel Dekher, 1994.

B. Tech. (Seventh Semester) Mechanical Engineering(Auto)
Project I
ME 409 E

P/D	Total	
7	7	Viva voce : 100 marks Sessional : 100 marks Duration of Exams. : 03 hours

The students expected to take up a project under the guidance of teacher from the college. The project must be based on mechanical engineering problems, which can be extended up to the full academic session. The students may be asked to work individually or in a group not more than four students in a group. Viva- voce must be based on the preliminary report submitted by students related to the project.

B. Tech. (Seventh Semester) Mechanical Engineering(Auto)

AUTOMOTIVE TRANSMISSION LAB

MEA 411 E

P/D	Total	
2	2	Viva voce : 25 marks Sessional: 25 marks

List of experiments

1. Study of a layout of transmission system for a front wheel drive, rear wheel drive and a four wheel drive arrangement
2. Trouble shooting in different types of friction clutches
3. Study of layout of gears and shafts in a manual type gearbox and a transaxle.
4. Trouble shooting in manual type of gearbox and a transaxle
5. Study of layout in a manual & automatic gearbox for a two wheeler
6. Trouble shooting in gearbox of two wheeler of previous experiment
7. Study of layout of an automatic gearbox.
8. Study of gear shifting controls in an automatic gearbox
9. Trouble shooting in an automatic gearbox
10. Study of performance of an automatic gearbox.
11. Study of a manual and electric Transfer Case.
12. Trouble shooting in Transfer Case of previous experiment.
13. Study of an electric drive in an Electric vehicle

B. Tech. (Seventh Semester) Mechanical Engineering
Practical training report
ME 413 E

P/D	Total	
-	-	**Sessional : 125 marks**
		Duration of Exams. : 03 hours

Student will submit summer training (about 8 weeks' industrial training) report for his/her assessment.

B. Tech. (Seventh semester) Mechanical engineering

AUTOMOTIVE CHASSIS (PRACTICAL)

MEA 415 E

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

LIST OF EXPERIMENT

1. Study of layout of a chassis and its different components, of a vehicle.
2. Trouble shooting in different types of steering systems - mechanical and power and various steering linkages.
3. Measurement of steering geometry angles – Wheel Alignment.
4. Study of impact of steering geometry angles on vehicle
5. Study of different types of wheels (rims) and tyres and their defects
6. Conducting Wheel balancing of a given wheel assy.
7. Trouble shooting in Propeller Shafts and Drive shafts including constant velocity joints.
8. Trouble shooting in different types of dead axles (front or rear)
9. Trouble shooting in different types of live axles and Differential systems.
10. Trouble shooting in suspensions of following types:

a. Leaf Spring
b. Double Wishbone with Torsion Bar or Coil Spring c. McPherson Strut Type
d. Five Bar Link type
e. Air Suspension system
f. A shock absorber (damper)

Trouble shooting in braking system in master and wheel cylinder, drum and disc brakes, overhauling and adjusting of system and its testing on brake tester

B. Tech. (Seventh Semester) Mechanical Engineering(Auto)
AUTOMOTIVE ELECTRICALS & SYSTEMS (Practical)
MEA 417 E

L	T	P/D	Total
-	-	2	2

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

List of Experiments

1. To understand the layout of complete wiring system of an automobile.
2. Perform the various tests for checking the battery condition.
3. To understand and test the charging circuit and charging motor.
4. To conduct performance test on a dynamo, alternator & starter motor.
5. To understand & test the starting circuit and trouble shooting in it.
6. Understand and test the conventional ignition system, setting of contact breaker points and spark plug gap.
7. Understand the working and testing of an Electronic Ignition system
8. Understand and test the lighting circuit of a car.
9. Conduct headlamp focusing as per the procedure.
10. Study the working of different accessories of a modern car
11. To study the layout / working of a Fuel Cell powered electric car.

B. Tech. (Eighth Semester) Mechanical Engineering (Auto)
ENTERPRENEURSHIP
ME-402E

L	T	P	Total		
3	1		4	Sessional Marks	: 50
				Theory	: 100
				Duration of Exam: 3 Hrs.	

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

UNIT I

Definition and concept, Importance of economics for engineers, present value and future value, Wealth, Goods, Wants, Value and price, capital, money, utility of consumer and producer goods.

Introduction, Elements of cost, Prime cost, Overhead, Factory cost, Total cost, Selling price, Nature of cost, Types of cost.

Definition and concept, Causes of depreciation, Methods of calculating depreciation.

UNIT II

Introduction, Nature of selection problem, Nature of replacement problem, Replacement of items which deteriorate, Replacement of machines whose operating cost in crease with time and the value of money also changes with time, methods used in selection of investment and replacement alternatives.

Entrepreneurship, Role of Entrepreneur in Indian economy, Characteristics of an entrepreneur, Types of entrepreneurs, some myths and realities about entrepreneurship

UNIT III

Introduction, Role and scope of small scale industries, concept of small scale and ancillary industrial undertakings, How to start a small scale industry, Steps in launching own venture, procedure for registration of small scale industries, various developmental agencies-their functions and role in industrial and entrepreneurship development, Infrastructure facilities available for entrepreneurship development in India.

Introduction, Requirement of a good product design, product development approaches, Product development process, Elements of concurrent engineering, quality function development, Rapid prototyping, Various controlling agencies involved -their role and formalities for getting clearance before starting individual venture

UNIT IV

Financial concept for small-scale industries, financial requirements Financial support programmer of banks, government financial agencies, Hire-purchase facilities alternate sources of finance. The modern concept of marketing, Definitions, functions and principle of marketing, marketing research, Advertising, Market survey, Pre-feasibility and feasibility of project. Identification and evaluation of business opportunity, risk involved =and preparation of business plan. Tools for evaluation of techno economic feasibility project report, SWOT analysis

Reference and Text Books:

1. The practice of Entrepreneurship - By G. G. Meredikh, R.E. Nelson and P.A. Neck
2. Handbook of Entrepreneurship - By Rao and Pareek
3. Automobile Engineering -By K.M. Gupta, Umesh Publications
3. Engineering Economics -By Tarachand
4. Industrial Engineering and Management -By Ravi Shankar
5. Industrial Engineering and Organization Management -By S.K.Sharma and Sawita Sharma
6. Industrial Engineering and Management -By O.P. Khanna

B. Tech. (Eighth Semester) Mechanical Engineering(Auto)

POWER PLANT ENGINEERING

ME-404E

L	T	P	total		
4	1		5	Sessional Marks	: 50
				Theory	: 100
				Duration of Exam: 3 Hrs.	

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

UNIT I

Conventional and non-conventional sources of energy; Importance of electrical energy; Geothermal power plants; Tidal power plants; Windmills; Solar power plants; Direct energy conversion systems; Energy sources in India; Recent developments in power plants. Hydrology: rainfall, runoff, hydrographs, flow duration curves; Site selection for hydro power plants; Classification of hydro power plants; Storage type hydro power plant and its operation; Estimation of power availability; Selection of water turbines; Combination of hydro power plants with steam plants; advantages and disadvantages of hydro power plants.

UNIT II

Analysis of steam power cycles for power plant application; High pressure boilers- La-Mont boiler, Benson boiler, Loeffler boiler; Velox boiler; Super pressure steam power plants; Economizers; Air-preheaters; Super heaters and reheaters; Feed water heaters. General layout of thermal power plant; Site selection for thermal power plant; Coal as fuel, classification of coals, analysis of coal; Coal handling; Dead and live storage; Combustion of coal: coal burning methods, overfeed stokers, underfeed stokers, pulverized fuels and burners. Ash handling and disposal; Dust collectors. Heat balance sheet for thermal power plants.

Introduction; Field of use; Outline of diesel electric power plant; Different systems of diesel power plant; Supercharging of diesel engines; Performance of diesel power plant; Advantages and disadvantages of diesel plants over thermal power plants.

UNIT III

Elements of plant; Thermal refinements; Performance of plants; Gas turbine characteristics; Comparison with other plants; Combined steam and gas turbine power plants.

Basic theory and terminology; Nuclear fission and fusion processes; Fission chain reaction; Moderation; Fertile materials; Nuclear fuels; General components of nuclear reactor; Different types of reactors; Breeder reactors; Nuclear power plants in India; Disposal of nuclear waste.

UNIT IV

Introduction; Load curves; Different terms and definitions; Effects of variable loads on power plant design and operation

Cost of electrical energy; Selection of type of generation; selection of generating equipment; performance and operating characteristics of power plants; Load division among generators; Tariffs methods for electrical energy.

Reference and Text Books:

1. Power Plant Engineering -By Morse
2. Power Plant Engineering -By Domkundwar
3. Power Plant Engineering -By P.C. Sharma
4. Power Plant Technology -By El-Wakil

B. Tech. (Eighth Semester) Mechanical Engineering(Auto)

OPERATION RESEARCH

ME-406E

L	T	P	total		
3	1		4	Sessional Marks	: 50
				Theory	: 100
				Duration of Exam: 3 Hrs.	

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

UNIT I

Development of operations Research, characteristics and scope of operations Research, operations Research in Management, Models in operations Research, Model Formulation, Types of mathematical models, Limitations of operations Research.

L.P. models, simplex method, the algebra of simplex method. (Minimization and Minimization problems), The big M method, post optimality analysis, essence of duality theory, Application of sensitivity analysis.

UNIT II

Introduction to model, matrix terminology, Formulation and solution of Transportation model (least cost method, Voyel's Approximation method), Least time transportation problem, Assignment problems.

Introduction to net work logic, Numbering of events (Fulkersen Rule), PERT calculations - Forward path, back-ward path. Slack, probability, comparison with PERT, Critical path, Floats. Project cost, crashing the net work, updating (PERT and CPM).

UNIT III

Introduction, applications of simulation, advantages and limitations of simulation technique, generation of random numbers, Time-flow mechanism, simulation languages.

Steps in decision theory approach, Decision Machinery environment, Decision machining under certainty and uncertainty, Decision machining under condition of risk, Decision trees, Minimum enchained criteria, Advantages and limitations of decision tree solutions, post optimality

Definition of arguments models, comparison with transport model, Mathematical representation of assignment model, Formulation and solution of argument models, variation of the argument model, Alternate optimal solutions

UNIT IV

Introduction, Applications of queuing Theory, Waiting time and idle time costs, single channel queuing theory and multi channel queuing theory with Poisson. arrivals and exponential services, Numerical on single channel and multi channel queuing theory.

Theory of games, competitive games, Rules and Terminology in game Theory, Rules for game theory- saddle point, dominance, mixed strategy (2 x2 games) , mixed strategy (2 x n games or m x 2 games), mixed strategy (3 x3 games), two person zero sum games, n-person zero sum games.

Reference and Text Books:

1. Introduction to operation research- By Hillier and Lieberman, McGraw-Hill
2. Operations Research - By P.K. Gupta and D.S. Hira
3. Linear Programming -By N.P. Loomba

B. Tech. (Eighth Semester) Mechanical Engineering(Auto)

AUTOMOTIVE ELECTRONICS AND MICROCONTROLLERS
MEA-408E

L	T	P	total	
4	1		5	

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

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

UNIT I

Basic Electronics
Introduction, Electronic devices and circuits, Amplifiers, Converters, Digital Electronics.
Microprocessors
Block diagram of microcomputer, Architecture of Intel 8085, Importance of Data, Address and Control buses, Instruction formats, Addressing modes and types of instructions in Intel 8085, Instruction set of 8085. Memory Devices, RAM, ROM Types, Microprocessor interfacing with memory chips. LAN and CAN Network basics

UNIT II

Microcontrollers
Comparison of microprocessor & microcontrollers, survey of 4,8,16 & 32 bit microcontrollers. Architecture of 8051:Block Diagram, oscillator & clock, Program Counter, registers, Flags, Internal memory, stack & stack pointer, special function register, Input/Output Pins, Ports and Circuits, External memory, Counters & Timers, Serial Data input/output interrupts. DC Motor and Stepper motor controls.

UNIT III

Electronic fuel control system
Introduction, components, Open loop and closed loop control systems, intake manifold pressures, mass air flow rate sensor, Throttle body injection and multi port or point fuel injection, Fuel injection system, Injector operations, Injection system controls.
Digital engine control system
Motivation for electronic engine control, concept, parameters, variables, Engine mapping, control strategy, Electronic engine management components, layout. Engine cranking and warm up control, Acceleration enrichment, Deceleration leaning and idle speed control. EGR control, Variable valve timing control, Electronic Ignition control, Electronic spark timing control. Exhaust emission control engineering, Integrated engine control system.

UNIT IV

Transmission control systems:

Electronic transmission management: components, layout. Electronic control of automatic transmissions, valve actuating control system, two-wheel drive control, four-wheel drive control, all wheel drive auto control system. Electric vehicle drive controls: Electronic control of hybrid and electric vehicles. Digital controllers for drive-motor, motor-generator, battery and fuel cell.

Chassis Control system

Electronic management of chassis system, Cruise control systems. Electronic suspension system, antilock braking controls system, traction control system, and vehicle stability control system. Electronic Steering control. Body controls and Security

Body control systems: Remote central locking, Key less entry, Automatic Air conditioning systems. Security systems: immobilizer, and warning systems. Telematics, GPS Systems, Electronic control system diagnostics.

Text Books:

1. William B.Riddens, " Understanding Automotive Electronics ", 5th Edition, Butterworth, Heinemann Woburn, 1998.
2. William L Husselbee, " Automotive Computers and Control System: Fundamentals and Service ". Hartcourt
Brace Professional Publications.
3. Thomas H Denton, "Automobile Electrical and Electronic Systems", SAE Publication.
4. Bosch Automotive Handbook, Latest Edition, SAE Publication
5. Bechtold., " Understanding Automotive Electronic ", SAE Publication
6. Ronald K Jurgen, “Automotive Microcontrollers” SAE Publications
7. Ronald K Jurgen, “ Passenger Safety and Convenience Systems” SAE Publications
8. T.Mellard, " Automotive Electronics ".

B. Tech. (Eighth Semester) Mechanical Engineering(Auto)

COMPUTATIONAL FLUID DYNAMICS

ME-441E

L	T	P	total		
3	1		4	Sessional Marks	: 50
				Theory	: 100
				Duration of Exam: 3 Hrs.	

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

UNIT I

Methods of prediction: comparison of experimental investigation Vs theoretical calculation; Mathematical description of physical phenomena; significance of governing differential equations; the general form of governing differential equation.
Classification of problems: Physical classification: Equilibrium problems and Marching problems; Mathematical classification: Elliptic, parabolic and hyperbolic partial differential equations; Nature of co-ordinates; one way and two-way co-ordinates; Proper choice of co-ordinates.

UNIT II

The concept of discretisation; Finite differences; Taylor series formulation; Finite difference discretisation of ordinary and partial derivatives; Truncation error, round-off error, discretisation error; Consistency and stability of numerical schemes; Variation formulation; Method of weighted Residuals, control volume formulation.

UNIT III

Steady one- dimensional Conduction, The inter-face conductivity, Non linearity, Source-Term Linearization, Types of Boundary Conditions. Unsteady one-dimensional Conduction: Explicit, Crank-Nicolson and Fully Implicit scheme's Discretisation of two and threedimensional problems, Stability analysis.

UNIT IV

Steady one dimensional convection and diffusion, The up wind scheme, Generalized Formulation, Discretisation equation for two and three dimensional problems, The outflow Boundary condition, false Diffusion.
Basic difficulty, Vorticity Based methods, Representation of the continuity equation, the staggered grid: the momentum equations, the pressure velocity corrections, and SIMPLE algorithm.

Reference and Text Books:

1. Computational Fluid Dynamics
- By Anderson, McGraw-Hill
2. Numerical Heat Transfer and fluid flow
- By Patankar, McGraw-Hill

B. Tech. (Eighth Semester) Mechanical Engineering(Auto)
Entrepreneurship (Practical)
ME 408 E

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

1. Exercise on assessing the industrial potentiality of any particular area.
2. Exercise on market survey for product identification and demand estimation of the product.
3. Exercise on preparation of techno economic feasibility project report.
4. Presentation and group discussion on techno economic feasibility project report

B. Tech. (Eighth Semester) Mechanical Engineering(Auto)

Project-II

ME 410 E

L	T	P/D	Total	
-	-	9	9	**Practical: 100Marks**
				Sessional: 100 marks

The student is expected to finish the remaining portion of the project

B. Tech. (Eighth Semester) Mechanical Engineering (Auto)
Seminar
ME 411 E

P/D	Total	
2	**2**	**Sessional: 25 marks**

Student will give a talk on some technical topics.