MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 1st YEAR MECHANICAL ENGINEERING,(PART TIME)
1st SEMESTER

EFFECTIVE FROM THE SESSION 2012-13

Course	Course Title	Teaching Schedule				Marks for Class Work	Marks for Examination		Total marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
MAT-201-F	Mathematics	3	2	-	5	50	100	-	150	3
HUM-203-F	Fundamentals of Management	3	1	-	4	50	100	-	150	3
ME-201-F	Thermodynamics	3	1	-	4	50	100	-	150	3
ME-205-F	Engineering Mechanics	3	1	-	4	50	100	-	150	3
ME-209-F	Machine Drawing	1	-	3	4	50		50	100	4
ME-213-F	Engineering Mechanics Lab	-	-	2	2	25	-	25	50	3
	Total	13	5	5	23	275	400	75	750	

Note:
1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 1st YEAR MECHANICAL ENGINEERING,(PART TIME)
2nd SEMESTER

EFFECTIVE FROM THE SESSION 2012-13

Course	Course Title	Teaching Schedule				Marks for Class Work	Marks for Examination		Total marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
HUM-201-F	Engineering Economics	3	1		4	50	100	-	150	3
ME-202-F	Manufacturing Technology -1	3	1	-	4	50	100	-	150	3
ME-206-F	Strength of Materials-1	3	1	-	4	50	100	-	150	3
ME-210-F	Steam & Power Generation	3	1	-	4	50	100	-	150	3
ME-214-F	Strength of Materials Lab	-	-	2	2	25	-	25	50	3
ME-218-F	Steam & Power Generation Lab	-	-	2	2	25	-	25	50	3
GES-106-F	Environmental Studies	1	0	2	3	-	-	-	-	-
GP-102-F	General Proficiency	-	-	2	2	50	-	-	50	-
	Total	13	4	8	25	300	400	50	750	

Note:
1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 2ND YEAR MECHANICAL ENGINEERING,(PART TIME)
3RD SEMESTER

EFFECTIVE FROM THE SESSION 2012-13

Course	Course Title	Teaching Schedule				Marks for Class Work	Marks for Examination		Total marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
ME-203-F	Computer Aided Design	3	1	-	4	50	100	-	150	3
ME-207-F	Material Science	3	1	-	4	50	100		150	3
ME-303-F	Mechanical Machine Design-1	3	2	-	5	50	100	-	150	4
ME-309-F	Manufacturing Technology –II	3	1	-	4	50	100	-	150	3
ME-211-F	Computer Aided Design Lab	-	-	2	2	25	-	25	50	3
ME-215-F	Materials Science Lab	-	-	2	2	25	-	25	50	3
ME-319-F	Manufacturing Technology –II Lab	-	-	2	2	25	-	25	50	3
	Total	12	5	6	23	275	400	75	750	

Note:
1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 2ND YEAR MECHANICAL ENGINEERING,(PART TIME)
4th SEMESTER

EFFECTIVE FROM THE SESSION 2012-13

Course	Course Title	Teaching Schedule				Marks for Class Work	Marks for Examination		Total marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
ME-204-F	Kinematics of Machine	3	1		4	50	100	-	150	3
ME-208-F	Fluid Mechanics	3	1		4	50	100	-	150	3
ME-304-F	Mechanical Machine Design-II	3	2		5	50	100	-	150	4
ME-312-F	Industrial Engineering	3	1		4	50	100	-	150	3
ME-212-F	Kinematics of Machine Lab	-	-	2	2	25	-	25	50	3
ME-216-F	Fluid Mechanics Lab	-	-	2	2	25	-	25	50	3
GP-202-F	General Proficiency	-	-	2	2	50	-	-	50	-
	Total	12	5	6	23	300	400	50	750	

Note:
1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 3RD YEAR MECHANICAL ENGINEERING,(PART TIME)
5TH SEMESTER

EFFECTIVE FROM THE SESSION 2012-13

Course	Course Title	Teaching Schedule				Marks for Class Work	Marks for Examination		Total marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
ME-301-F	Dynamics Of Machines	3	1	-	4	50	100	-	150	3
ME-305-F	Fluid Machine	3	1	-	4	50	100	-	150	3
ME-307-F	Internal Combustion Engines & Gas Turbines	3	1	-	4	50	100	-	150	3
ME-311-F	Applied Numerical Technique & Computing	3	-	-	3	50	100	-	150	3
ME-313-F	Dynamics Of Machines Lab	-	-	2	2	25		25	50	3
ME-315-F	Fluid Machine Lab	-	-	2	2	25		25	50	3
ME-317-F	Internal Combustion Engines & Gas Turbines Lab			2	2	25		25	50	3
ME-321-F	Applied Numerical Technique & Computing Lab	-	-	2	2	50			50	3
	Total	12	3	8	23	325	400	75	800	

Note:
1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 3RD YEAR MECHANICAL ENGINEERING,(PART TIME)
6TH SEMESTER

EFFECTIVE FROM THE SESSION 2012-13

Course	Course Title	Teaching Schedule				Marks for Class Work	Marks for Examination		Total marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
ME-302-F	Automobile Engineering	3	1	-	4	50	100	-	150	3
ME-306-F	Heat Transfer	3	1	-	4	50	100	-	150	3
ME-308-F	Automatic Control	3	1	-	4	50	100	-	150	3
ME-310-F	Measurement & instrumentation	3	1	-	4	50	100	-	150	3
ME-314-F	Automobile Engineering Lab	-	-	2	2	25	-	25	50	3
ME-316-F	Heat Transfer Lab	-	-	2	2	25	-	25	50	3
ME-318-F	Measurement & instrumentation Lab	-	-	2	2	25	-	25	50	3
ME-320-F	General Proficiency	-	-	2	2	50	-		50	
	Total	12	4	8	24	325	400	75	800	

Note:
1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 1st YEAR MECHANICAL ENGINEERING,(PART TIME)
1st SEMESTER

EFFECTIVE FROM THE SESSION 2012-13

Course	Course Title	Teaching Schedule				Marks for Class Work	Marks for Examination		Total marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
MAT-201-F	Mathematics	3	2	-	5	50	100	-	150	3
HUM-203-F	Fundamentals of Management	3	1	-	4	50	100	-	150	3
ME-201-F	Thermodynamics	3	1	-	4	50	100	-	150	3
ME-205-F	Engineering Mechanics	3	1	-	4	50	100	-	150	3
ME-209-F	Machine Drawing	1	-	3	4	50		50	100	4
ME-213-F	Engineering Mechanics Lab	-	-	2	2	25	-	25	50	3
	Total	13	5	5	23	275	400	75	750	

Note:
1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

MAT-201F MATHEMATICS

L T P	Class Work : 50 Marks
3 2 -	Theory : 100 Marks
	Total : 150 Marks
	Duration of Exam. : 3 Hrs.

NOTE: Examiner will set 9 questions in total, with two questions from each section and

one question covering all sections which will be Q.1. This Q.1 is compulsory and of shortanswers type. Each question carries equal mark (20 marks). Students have to attempt 5questions in total at least one question from each section.

Section-A

Fourier Series and Fourier Transforms : Euler's formulae, conditions for a Fourier expansion, change of interval, Fourier expansion of odd and even functions, Fourier expansion of square wave, rectangular wave, saw-toothed wave, half and full rectified wave, half range sine and cosine series.

Fourier integrals, Fourier transforms, Shifting theorem (both on time and frequency axes),Fourier transforms of derivatives, Fourier transforms of integrals, Convolution theorem,Fourier transform of Dirac-delta function.

Section-B

Functions of Complex Variable: Definition, Exponential function, Trigonometric and Hyperbolic functions, Logarithmic functions. Limit and Continuity of a function, Differentiability and Analyticity.

Cauchy-Riemann equations, necessary and sufficient conditions for a function to be analytic, polar form of the Cauchy-Riemann equations. Harmonic functions, application to flow problems. Integration of complex functions. Cauchy-Integral theorem and formula.

Section-C

Power series, radius and circle of convergence, Taylor's Maclaurin's and Laurent's series. Zeroes and singularities of complex functions, Residues. Evaluation of real integrals using residues (around unit and semi circle only).

Probability Distributions and Hypothesis Testing: Conditional probability, Bayes theorem and its applications, expected value of a random variable. Properties and application of Binomial, Poisson and Normal distributions.

Section-D

Testing of a hypothesis, tests of significance for large samples, Student's t-distribution (applications only), Chi-square test of goodness of fit.

Linear Programming: Linear programming problems formulation, solving linear programming problems using (i) Graphical method (ii) Simplex method (iii) Dual simplex method.

TEXT BOOKS:

1. Engineering Mathematics by Babu Ram (Pearson media Publication)

2. Advanced Engg. Mathematics: F Kreyszig.

3. Higher Engg. Mathematics: B.S. Grewal.

REFERENCE BOOKS :

1. Advance Engg. Mathematics: R.K. Jain, S.R.K.Iyenger.

2. Advanced Engg. Mathematics: Michael D. Greenberg.

3. Operation Research: H.A. Taha.

4. Probability and statistics for Engineers: Johnson. PHI.

HUM-203F FUNDAMENTALS OF MANAGEMENT

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

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A

Meaning of management, Definitions of Management, Characteristics of management, Management vs. Administration. Management-Art, Science and Profession. Importance of Management. Development of Management thoughts. Principles of Management. The Management Functions, Inter-relationship of Managerial functions.

Nature and Significance of staffing, Personnel management, Functions of personnel management, Manpower planning, Process of manpower planning, Recruitment, Selection; Promotion - Seniority Vs. Merit. Training - objectives and types of training.

Section-B

Production Management : Definition, Objectives, Functions and Scope, Production Planning and Control; its significance, stages in production planning and control. Brief introduction to the concepts of material management, inventory control; its importance andvarious methods**.**

Section-C

Marketing Management - Definition of marketing, marketing concept, objectives & Functions of marketing. Marketing Research - Meaning; Definition; objectives; Importance; Limitations; Process. Advertising - meaning of advertising, objectives, functions, criticism.

Section-D

Introduction of Financial Management, Objectives of Financial Management, Functions and Importance of Financial Management. Brief Introduction to the concept of capital structure and various sources of finance.

TEXT BOOKS:

1. Principles and Practice of Management - R.S. Gupta, B.D.Sharma, N.S. Bhalla.

(Kalyani Publishers)

2. Organisation and Management - R.D. Aggarwal (Tata Mc Graw Hill)

REFERENCE BOOKS:

1. Principles & Practices of Management – L.M. Prasad (Sultan Chand & Sons)

2. Management – Harold, Koontz and Cyrilo Donell (Mc.Graw Hill).

3. Marketing Management – S.A. Sherlikar (Himalaya Publishing House, Bombay).

4. Financial Management - I.M. Pandey (Vikas Publishing House, New Delhi)

5. Management - James A.F. Stoner & R.Edward Freeman, PHI.

ME-201F THERMODYNAMICS

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

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of shortanswers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A

Basic Concepts: Macroscopic and Microscopic Approaches, 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, Problems.

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

Section-B

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, PMMSK. Carnot Cycle, Carnot Heat Engine and Carnot Heat Pump, Carnot Theorem and its Corollaries, Thermodynamic Temperature Scale. Entropy, Clausius Inequality, Principle of Entropy Increase, Temperature Entropy Plot, Entropy Change in Different Processes, Introduction to Third Law of Thermodynamics. Problems.

Availability and Irreversibility: High and Low Grade Energy, Availability and Unavailable Energy, Loss of Available Energy Due to Heat Transfer Through a Finite Temperature Difference, Dead state of a system, Availability of a Non-Flow or Closed System, Availability of a Steady Flow System, Helmholtz and Gibb's Functions, Effectiveness and Irreversibility, Second law efficiencies of processes & cycles. Problems.

Section-C

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. Problems.

Ideal and Real Gases: Concept of an Ideal Gas, Basic Gas Laws, Characteristic Gas Equation, Avogadro'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, Mass, Mole and Volume Fraction, Gibson Dalton's law, Gas Constant and Specific Heats, Entropy for a mixture of non-reactive

gases. Problems.

Section-D

Thermodynamic Relations: Maxwell Relations, Clapeyron Equation, Relations for changes in Enthalpy and Internal Energy & Entropy, Specific Heat Capacity Relations, Joule Thomson coefficient & inversion curve.

Gas power Cycles: Carnot Cycle, Otto Cycle, Diesel Cycle, Dual Cycle,Stirling Cycle, Ericson cycle and Brayton cycle, Problems.

Text Books:

1. Engineering Thermodynamics – Jones and Dugan, PHI, New Delhi.

2. Fundamentals of Engineering Thermodynamics – E. Radhakrishnan, PHI, New

Delhi.

Reference Books:

1. Theory and Problems of Thermodynamics – Y. V.C. Rao, Wiley Eastern Ltd., New

Delhi.

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

3. Basics of Mechanical Engineering – Vineet Jain, Dhanpat Rai Publication

4. Engineering Thermodynamics – P K Nag, Tata McGraw Hill

ME-205F ENGINEERING MECHANICS

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

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A

Introduction: Force system, dimensions and units in mechanics, laws of mechanics, vectoralgebra, addition and subtraction of forces, cross and dot products of vectors, moment of aforce about a point and axis, couple and couple moment, transfer of a force to a parallel position, resultant of a force system using vector method, Problems involving vector application

Equilibrium: Static and dynamic equilibrium, static in determinacy, general equations of equilibrium, Varingnon's theorem, Lami's theorem, equilibrium of bodies under a force system, Problems.

Section-B

Truss and Frames:Truss, classification of truss, assumptions in truss analysis, perfect truss, analysis of perfect plane truss using method of joints and method of sections, Problems.

Centroid , Centre of mass and Centre of gravity, Determination of centroid, centre of mass and centre of gravity by integration method of regular and composite figures and solid objects, Problems.

Section-C

Moment of Inertia: Area moment of inertia, mass moment of inertia, parallel axis and perpendicular axis theorems, radius of gyration, polar moment of inertia, product of inertia,principle axis, problem based on composite figures and solid objects.

Kinematics: Concept of rigid body, velocity and acceleration, relative velocity, translation and rotation of rigid bodies, equations of motion for translation and rotation, problems.

Section-D

Particle Dynamics: Energy methods and momentum methods, Newton's laws, work energy equation for a system of particles, linear and angular momentum equations, projectile motion, problem.

Shear Force and Bending Moment Diagram for statically determinant beams Classification of beams, types of loads, shear force and bending moment calculation and their graphical presentation, point of inflection, problem.

Recommended Books:-

Engineering Mechanics – Irving H. Shames, PHI Publication

Engineering Mechanics – U.C.Jindal, Galgotia Publication

Engineering Mechanics – A.K.Tayal, Umesh Publication

ME-209F MACHINE DRAWING

L T P

1 - 3

Sessional : 50 Marks

Practical Examination : 50 Marks

Total : 100 Marks

Duration of Exam : 4 hrs

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section A

Introduction graphic language classification of drawing, principal of drawing, IS codes for machine drawing, lines, scales, section dimensioning, standard abbreviation, – Limits , fits and Tolerance (Dimensional and Geometrical tolerance) , Surface finish, Gears : Gear terminology, I.S. convention representation of assembly of spur gears, helical gears, bevel gears , worm and worm wheel.

Section B

Orthographic projections: principle of first and third angle projection, orthographic views from isometric views of machine parts / components. Drawing of sectional views:- Coupling, Crankshaft, Pulley, Piston and Connecting rod, Cotter and Knuckle joint.

Riveted Joint and Welded Joint. Free hand sketching: Need for free hand sketching of standard parts and simple machines components.

Section C

Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies: Lathe Tail stock, Machine vice, Pedestal bearing

Section D

Assembly drawing with sectioning and bill of materials from given detailed drawings of assemblies Steam stop valve, Stuffing box, Drill jigs and Milling fixture.

Text Books:

1. Machine Drawing - N D Bhatt and V M Panchal, Charotar Publishing House.

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

3. Engineering Graphics with Auto CAD 2002 -JamesD.Bethune, Pearson Education.

Reference Books:

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

2. Machine drawing by N Sidheshwar, Kannaieh, V S Sastry, TMH., New Delhi.

ME- 213F ENGINEERING MECHANICS LAB

	Sessional : 25 Marks
L T P	Practical Examination : 25 Marks
- - 2	Total : 50 Marks
	Duration of Exam: 3 Hrs

List of Experiments:

1. Verification of reciprocal theorem of deflection using a simply supported beam.
2. Verification of moment area theorem for slopes and deflections of the beam.
3. Deflections of a truss-horizontal deflections & vertical deflections of various joints of a pin-jointed truss.
4. Elastic displacements (vertical & horizontal) of curved members.
5. Experimental and analytical study of 3 hinged arch and influence line for horizontal thrust.
6. Experimental and analytical study of behavior of struts with various end conditions.
7. To determine elastic properties of a beam.
8. Experiment on a two-hinged arch for horizontal thrust & influence line for Horizontal thrust.
9. Experimental and analytical study of a 3 bar pin jointed Truss.
10. Experimental and analytical study of deflections for unsymmetrical bending of a Cantilever beam.

Note:-

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

2. At least six experiments should be performed from the above list. Remaining two experiments

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Course	Course Title	Teaching Schedule				Marks for Class Work	Marks for Examination		Total marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
HUM-201-F	Engineering Economics	3	1		4	50	100	-	150	3
ME-202-F	Manufacturing Technology -1	3	1	-	4	50	100	-	150	3
ME-206-F	Strength of Materials-1	3	1	-	4	50	100	-	150	3
ME-210-F	Steam & Power Generation	3	1	-	4	50	100	-	150	3
ME-214-F	Strength of Materials Lab	-	-	2	2	25	-	25	50	3
ME-218-F	Steam & Power Generation Lab	-	-	2	2	25	-	25	50	3
GES-106-F	Environmental Studies	1	0	2	3	-	-	-	-	-
GP-102-F	General Proficiency	-	-	2	2	50	-	-	50	-
	Total	13	4	8	25	300	400	50	750	

Note:
1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

HUM-201F ENGINEERING ECONOMICS

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

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A

Definition of Economics - various definitions, Nature of Economic problem, Production possibility curve Economic laws and their nature. Relation between Science, Engineering,Technology and Economics. Concepts and measurement of utility, Law of Diminishing Marginal Utility, Law of equi-marginal utility - its practical application and importance.

Section-B

Meaning of Demand, Individual and Market demand schedule, Law of demand, shape of demand curve, Elasticity of demand, measurement of elasticity of demand, factors effecting elasticity of demand, practical importance & applications of the concept of elasticity of demand. Meaning of production and factors of production; Law of variable proportions, Returns to scale, Internal and External economics and diseconomies of scale.

Section-C

Various concepts of cost - Fixed cost, variable cost, average cost, marginal cost, money cost, real cost opportunity cost. Shape of average cost, marginal cost, total cost etc. in short run and long run. Meaning of Market, Types of Market - Perfect Competition, Monopoly, Oligopoly, Monopolistic Competition (Main features of these markets)

Section-D

Supply and Law of Supply, Role of Demand & Supply in Price Determination and effect of changes in demand and supply on prices. Nature and characteristics of Indian economy (brief and elementary introduction), Privatization - meaning, merits and demerits. Globalisation of Indian economy - merits and demerits. Elementary Concepts of VAT, WTO, GATT & TRIPS agreement.

TEXT BOOKS:

1. Principles of Economics: P.N. Chopra (Kalyani Publishers).

2. Modern Economic Theory – K.K. Dewett (S.Chand)

REFERENCE BOOKS:

1. A Text Book of Economic Theory Stonier and Hague (Longman's Landon)

2. Micro Economic Theory – M.L. Jhingan (S.Chand)

3. Micro Economic Theory - H.L. Ahuja (S.Chand)

4. Modern Micro Economics : S.K. Mishra (Pragati Publications)

5. Economic Theory - A.B.N. Kulkarni & A.B. Kalkundrikar (R.Chand & Co.)

6. Indian Economy: Rudar Dutt & K.P.M. Sundhr

ME-202F MANUFACTURING TECHNOLOGY-I

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

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A

Metal Cutting & Tool Life: Introduction, basic tool geometry, single point tool nomenclature, chips types and their characters tics, mechanics of chips formation, theoretical and experimental determination of shear angle, orthogonal and oblique metal cutting, metal cutting theories, relationship of velocity, forces, and power consumption, cutting speed, feed and depth of cut, coolant, temperature profile in cutting, tool life relationship, tailor equation of tool life, tool material and mechanism

Economics of Metal Machining: Introduction, elements of machining cost, tooling economics, machining, economics and optimization, geometry of twist, drills and power calculation in drills.

Section-B

Metal forming Jigs and Fixtures: Introduction, Metal blow condition, theories of plasticity, conditions of plane strains, friction, conditions in metal working, wire drawing, theory of forging, rolling theory, no slip angle, and foreword slip, types of tools, principles of

locations, locating and clamping devices, jigs bushes, drilling jigs, milling fixtures, turning fixtures, boring and broaching fixtures, welding fixtures, different materials, for jigs and fixtures, economics of jigs and fixtures. Metrology: Measurement, linear and angular simple measuring instruments, various clampers, screw gauge, sine bar, auto-collimator, comparator- mechanical, electrical, optical, surface finish and its measurements, micro and macro deviation, factors influencing surface finish and evaluation of surface finish.

Section-C

Machine tools: Introduction, constructional features, specialization, operations and devicesof basic machine tools such as lathe, shaper, planner, drilling machining, and milling machine, indexing in milling operation, working principles of capstan and turret lathes.

Metal Casting Process: Introduction, Foundry: Introduction to Casting Processes, Basic Steps in Casting Processes. Pattern: Types of Pattern and Allowances. Sand Casting: Sand Properties, Constituents and Preparation. Mould & Core making with assembly and its Types. Gating System. Melting of Metal, Furnaces and Cupola, Metal Pouring, Fettling. Casting Treatment, Inspection and Quality Control, Sand Casting Defects & Remedies.

Section-D

.Welding: Introduction to Welding, Classification of Welding Processes, Gas Welding: Oxy-Acetylene Welding, Resistance Welding; Spot and Seam Welding, Arc Welding: Metal Arc, TIG & MIG Welding, Submerged arc welding (SAW), resistance welding

principles, electrode types and selection, thermit welding, electro slag welding, electron beam welding, laser beam welding, forge welding, friction welding, Welding Defects and remedies, brazing & soldering.

Forming Processes: Basic Principle of Hot & Cold Working, Hot & Cold Working Processes, Rolling, Extrusion, Forging, Drawing, Wire Drawing and Spinning. Sheet Metal Operations: Measuring, Layout marking, Shearing, Punching, Blanking, Piercing, Forming, Bending and Joining.

TEXT BOOK:

1. Manufacturing Engineering Technology, K. Jain, Pearson Education

2. Manufacturing Technology: Foundry, Forming and Welding by P.N.Rao, TMH.

3. Principles of Manufacturing Materials and Processes, James S.Campbell, TMH.

4. Welding Metallurgy by G.E.Linnert, AWS.

5. Production Engineering Sciences by P.C.Pandey and C.K.Singh, Standard Publishers

Ltd.

6. Manufacturing Science by A.Ghosh and A.K.Mallick, Wiley Eastern

ME-206F STRENGTH OF MATERIALS–I

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

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A

Simple Stresses & Strains: Concept & types of Stresses and strains, Poison'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.

Section-B

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 contra-flexure under (i) concentrated loads, (ii) uniformly distributed loads overwhole 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.

Section-C

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 combined bending, torsion & axial loading of beams.Numericals.

Columns & Struts: Column under axial load, concept of instability and buckling, slenderness ratio, derivation of Euler's 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.

Section-D

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 - Macmillan, India

2. Strength of Materials– Andrew Pytel and Fredinand L.Singer, Addison –

Wesley

REFERENCE BOOKS:

1. Strength of Materials – Popov, PHI, New Delhi.

2. Strength of Materials A Rudimentary Apprach – M.A. Jayaram, Sapna

Book House, Bangalore

ME-210F STEAM & POWER GENERATION

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

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A

Introduction: Components of Steam Power System, Carnot Cycle, Rankine Cycle, Modified Rankine Cycle, p-v , h-s and T-s diagram for Rankine and Modified Rankine Cycle, Mollier's diagram, use of steam table, Problem

Steam Generators: Purpose, Classification of boilers, Fire tube and water tube boilers, Mountings and accessories, description of Lancashire, Locomotive, Babcock Wilcox boilers, draught, design of natural draught chimney, artificial draught, mechanical draught, efficiency of boiler and heat balance.

Section-B

Steam Nozzles: Function of steam nozzles, shape of nozzles for subsonic and supersonic flow of steam, Steady state energy equation, continuity equation, nozzle efficiency, critical pressure ratio for max. Discharge, design of steam nozzle, problems.

Steam Engine: Working of steam engine, single acting and double acting steam engine, compounding of steam engine, ideal and actual indicator diagram, mean effective pressure, diagram factor, mechanical efficiency, thermal efficiency of steam engine.

Section-C

Steam Turbine: Classification of steam turbine, impulse turbine, working principle, compounding of impulse turbine, velocity diagram, power output and efficiency of a single stage impulse turbine, reaction turbine, working principle, degree of reaction, velocity diagram, power output, efficiency, condition for max. Efficiency, governing of steam turbines, problem. Improved Turbines: Back pressure and pass out turbines, Regenerative feed heating cycle, Binary vapour cycle.

Section-D

Steam Condensers: Classification of condensers, sources of air leakage in condensers,

effect of air leakage in condenser, vacuum efficiency, condenser efficiency, air pumps, cooling water calculation, and problem.

Fuel and Combustion: Classification of fuels – solid, liquid and gaseous fuels, calorific values of fuels, stochiometric air fuel ratio, excess air requirement, analysis of exhaust gases, problem.

RECOMMENDED BOOKS:-

1. Thermodynamics and Heat Engines Vol II – R. Yadav, Central Publishing House

2. Heat Engineering – V.P.Vasandani and D.S.Kumar, Metropolitan Book Co. Pvt. Ltd.

3. I.C.Engines - M.L.Mathur and Sharma Dhanpat Rai & Sons

4. Thermal Engineering - P.L.Balaney Khanna Publisher

ME- 214F STRENGTH OF MATERIAL-I LAB

L T P	Sessional : 25Marks
- - 2	Theory : 25 Marks
	Total : 50Marks
	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 Rockwellhardness 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 Gear of Single, Double and Triple start.

13. To determine Mechanical Advantage, Efficiency of Simple and Compound Screw Jack.

14. To find Moment of Inertia of a Fly Wheel.

Note:

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

4. 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.

ME-218F STEAM & POWER GENERATION LAB

L T P	Sessional : 25 Marks
- - 2	Practical/Viva : 25 Marks
	Total : 50 Marks
	Duration of Exam. : 3 Hrs.

List of Experiments:

1. To study low pressure boilers and their accessories and mountings.
2. To study high pressure boilers and their accessories and mountings.
3. To prepare heat balance sheet for given boiler.
4. To study the working of impulse and reaction steam turbines.
5. To find dryness fraction of steam by separating and throttling calorimeter.
6. To find power out put & efficiency of a steam turbine.
7. To find the condenser efficiencies.
8. To study and find volumetric efficiency of a reciprocating air compressor.
9. To study cooling tower and find its efficiency.
10. To find calorific value of a sample of fuel using Bomb calorimeter.
11. Calibration of Thermometers and pressure gauges.

Note:

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

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

GES-106F: ENVIRONMENTAL STUDIES

Theory 75 Marks
Field work 25 Marks
(Practical)

Unit-1 the Multidisciplinary nature of environmental studies. Definition scope and importance.

Unit-2 Natural Resources :

Renewable and non-renewable resources :Natural resources and associated problems.

a) Forest resources : Use and over-exploitation : deforestation, case studies. Timber extraction, mining dams and their effects on forests and tribal people.

b) Water resources : Use and over-utilisation of surface and goround water, floods, drought, conflicts over water, dams benefits and problems.

c) Mineral resources : Use and exploitation, environmental effects of extracting and using mineral resources, case studies.

d) Food resources : World food problems, changes, caused by agriculture and overgrazing, effects of modern agriculture, fertrilizer-pesticide problems, Water logging, salinity, case studies.

e) Energy resources : Growing energy needs; renewable and nonrenewable energy sources, use of alternate energy sources, case studies.

f) Land resources : Land as a resource, land degradation, man induced landslides, soil erosion and desertification.

* Role of an individual in conservation of natural resources.
* Equitable use of resources for sustainable lifestyles.

(8 lectures)

Unit-3 Ecosystems :

* Concept of an ecosystem.
* Structure and function of an ecosystem.
* Producers, consumers and decomposers.
* Energy flow in the ecosystem.
* Ecological succession.
* Food chains, food webs and ecological pyramids.
* Introduction, types, characteristic features, structure and function of the following eco-system :

a. Forest ecosystem.
b. Grassland ecosystem.
c. Desert ecosystem.
d. Aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries)

(6 lectures)

Unit-4 Biodiversity and its conservation

* Introduction - Definition : Genetic, Species and ecosystem diversity.
* Biogeographical classification of India.
* Value of biodiversity : consumptive use, productive use, social, ethical, aesthetic and option values.
* Biodiversity at global, National and local levels.
* India as a mega-diversity nation.
* Hot-spots of biodiversity.
* Threats to biodiversity : habitat loss, poaching of wildlife, man-wildlife conflicts.

* Endangered and endemic species of India.
* Conservation of biodiversity : In-situ and ex-situ conservation of biodiversity. (8 lectures)

Unit-5 Environmental pollution : Definition, causes, effects and control measures of :
a) Air pollution.
b) Water pollution
c) Soil pollution
d) Marine pollution
e) Noise pollution
f) Thermal pollution
g) Nuclear hazards
* Solids waster management : causes, effects and control measures of urban and industrial wastes.
* Role of an individual in preventation of pollution.
* Pollution cae studies.
* Disaster management : floods, earthquake, cyclone and landslides.

(8 lectures)

Unit-6 Social issues and the Environment :
* From unsustainable to sustainable development.
* Urban problems related to energy.
* Water conservation, rain water harvesting, watershed management.
* Resettlement and rehabilitation of people : its problems and concerns case studies.
* Environmental ethics : Issues and possible solutions.
* Climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust. Case studies.
* Wasteland reclamation.
* Consumerism and waste products.
* Environment Protrection Act.
* Air (Prevention and Control of pollution) Act.
* Water (Prevention and Control of pollution) Act.
* Wildlife Protection Act.
* Forest Conservation Act.
* Issues involved in enforcement of environmental legislation.
* Public awareness. (7 lectures)

Unit-7 Human population and the Environment.
Population growth, variation among nations. Population explosion- Family Welfare Programme. Environment and human health. Human Rights. Value Education. HIV/AIDS. Woman and Child Welfare Role of Informatoin Technology in Environment and human health. Case Studies. (6 lectures)

Unit-8 Field Work :
* Visit to a local area to document environmental assets - river/forest/grassland/hill/mountain.
* Visit to a local polluted site-urban/Rural/ Industrial/ Agricultural.
* Study of common plants, insects, birds.
* Study of simple ecosystems- pond, river, hill slopes, etc. (Field work equal to 5 lecture hours).

References

1. Agarwal, K.C. 2001 Environmental Biology, Nidi Pub. Ltd. Bikaner.
2. Bharucha, Frach, The Biodiversity of India, MApin Publishing Pvt. Ltd. Ahmedabad-380013, India, E-mail : mapin@icenet.net (R).
3. Brunner R.C. 1989, Hazardous Waste Incineration, Mc. Graw Hill Inc. 480p.
4. Clark R.S., Marine pollution, Slanderson Press Oxford (TB).
5. Cunningham, W.P. Cooper, T.H. Gorhani, E & Hepworth, M.T. 2001, Environmental Encyclopedia, Jaico Pub. House, Mumbai 1196 p.
6. De A.K., Environmental Chemistry, Wiley Eastern Ltd.
7. Down to Earth, Centre for Science and Environment (R).
8. Gleick, H.P., 1993. Water in crisis, Pacific Institute for Studies in Dev. Environment & Security Stockholm Env. Institute, Oxford Univ. Press, 473p.
9. Hawkins R.E. Encyclopedia of Indian Natural History, Bombay Natural History Society, Bombay (R).
10. Heywood, V.H. & Watson, R.T. 1995. Global Biodiversity Assessment, Cambridge Uni. Press 1140p.
11. Jadhav, H & Bhosale, V.M. 1995. Environmental Protection and Laws. Himalaya Pub. House, Delhi 284p.
12. Mackinney, M.L. & Schoch, RM 1996, Environmental Science systems & solutions, Web enhanced edition. 639p.
13. Mhaskar A.K., Mayyer Hazardous, Tekchno-Science Publications (TB).
14. Miller T.G. Jr. Environmental Science, Wadsworth Publishing Co. (TB).
15. Odum, E.P. 1971, Fundamentals of Ecology. W.B. Saunders Co. USA,
16. Rao M.N. & Datta, A.K. 1987 Waste Water Treatment. Oxford & TBH Publ. Co. Pvt. Ltd.
17. Sharma, B.K. 2001, Environmental Chemistry, Goal Publ. House, Meerut.
18. Survey of the Environment, The Hindu (M).
19. Townsend C., Harper J. and Michael Begon. Essentials of Ecology, Blackwell Science (TB).
20. Trivedi R.K., Handbook of Environmental Laws, Rules, Guidelines, Comliances and Standards, Vol. I and II Enviro Media (R).
21. Tridevi R.K. and P.K. Goal, Introduction to air pollution, Techno Science Publications (TR).
22. Wagner K.D., 1998, Environmental Management, W.B.Saunders co. Philadelphia, USA .
A text book environmental education G.V.S. Publishers by Dr. J.P. Yadav.

(M) Magazine
(R) Reference
(TB) Textbook

The scheme of the paper will be under : The subject of Environmental Studies will be included as a qualigying paper in all UG Courses (including professional courses also) and the students will be required to qualify the same otherwise the final result will not be declared and degree will not be awarded.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 2ND YEAR MECHANICAL ENGINEERING,(PART TIME)
3RD SEMESTER

EFFECTIVE FROM THE SESSION 2012-13

Course	Course Title	Teaching Schedule				Marks for Class Work	Marks for Examination		Total marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
ME-203-F	Computer Aided Design	3	1	-	4	50	100	-	150	3
ME-207-F	Material Science	3	1	-	4	50	100		150	3
ME-303-F	Mechanical Machine Design-1	3	2	-	5	50	100	-	150	4
ME-309-F	Manufacturing Technology –II	3	1	-	4	50	100	-	150	3
ME-211-F	Computer Aided Design Lab	-	-	2	2	25	-	25	50	3
ME-215-F	Materials Science Lab	-	-	2	2	25	-	25	50	3
ME-319-F	Manufacturing Technology –II Lab	-	-	2	2	25	-	25	50	3
	Total	12	5	6	23	275	400	75	750	

Note:
1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

ME- 203F COMPUTER AIDED DESIGN

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

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of shortanswers type. Each question carries equal mark (20 marks). Students have to attempt 5questions in total at least one question from each section.

Section-A

Introduction: Introduction to CAD, Design Process, Introduction to CAM/ CIMS, Importance and Necessity of CAD, Applications of CAD, Hardware and Software requirement of CAD, Basics of geometric and solid modeling, coordinate systems.
Transformations: Introduction, transformation of points and line, 2-D rotation, reflection, scaling and combined transformation, homogeneous coordinates, 3-D scaling, shearing, rotation, reflection and translation, combined transformations.

Section-B

Curves: Algebraic and geometric forms, tangents and normal, blending functions reparametrization, straight lines, conics, cubic splines, Bezier curves and B-spline curves. Surfaces and Solids: Plane surface, ruled surface, surface of revolution, tabulated cylinder, bi-cubic surface, Bezier surface, B-spline surface, Solid models and representation scheme, boundary representation, constructive solid geometry, sweep representation, cell decomposition.

Section-C

Automation and Numerical Control: Introduction, fixed, programmable and flexible automation, types of NC systems, MCU and other components, NC manual part programming, coordinate systems, G & M codes, Part program for simple parts, computer assisted part programming.
Group Technology: Part families, part classification and coding, production flow analysis, Machine cell design, Advantages of GT.

Section-D

Flexible Manufacturing Systems & Computer aided process planning: Introduction, FMS components, types of FMS, FMS layouts, planning for FMS, advantages and applications Conventional process planning, types of CAPP, Steps in variant process planning, planning for CAPP.
Finite Element Method: Introduction, Procedure, Finite Element Analysis, Finite Element Modeling, Analysis of 1D, 2D structural problems.

Text Books:

1. CAD/ CAM by Groover and Zimmer, Prantice Hall.
2. CAD/ CAM Theory and Practice by Zeid, McGraw Hill
3. Numerical Control and Computer Aided Manufacturing by Kundra, Rao & Tiwari, TMH.

Reference Books:

1. CAD/CAM (Principles, Practice & Manufacturing Management) by Chirs Mc Mohan

& Jimmie Browne, Published by Addison- Wesle

ME-207F MATERIAL SCIENCE

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

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A

Crystallography: Review of crystal structure, space lattice, crystal planes and crystal directions, co-ordination number, number of atoms per unit cell, atomic packing factor,

Numerical related to crystallography. Imperfection in metal crystals: Crystal imperfections and their classifications, point defects, line defects, edge & screw dislocations, surface defects, volume defects & effects of imperfections on metal properties.

Section-B

Solid solutions and phase diagram: Introduction to single and multiphase solid solutions and types of solid solutions, importance and objectives of phase diagram, systems, phase and structural constituents, cooling curves, unary & binary phase diagrams, Gibbs's phase rule, Lever rule, eutectic and eutectoid systems, peritectic and peritectoid systems, iron carbon equilibrium diagram and TTT diagram.

Heat Treatment: Principles, purpose, classification of heat treatment processes, annealing, normalizing, stress relieving, hardening, tempering, carburizing, nitriding, cyaniding, flame and induction hardening. Allotropic transformation of iron and steel, Properties of austenite, ferrite, pearlite, martensite.

Section-C

Deformation of Metal: Elastic and plastic deformation, mechanism of plastic deformation, twinning, conventional and true stress strain curves for polycrystalline materials, yield point phenomena, strain ageing, work hardening, Bauschinger effect, season cracking. Recovery, re-crystallization and grain growth.

Failures of metals: Failure analysis, fracture, process of fracture, types of fracture, fatigue, characteristics of fatigue, fatigue limit, mechanism of fatigue, factors affecting fatigue.

Section-D

Creep & Corrosion: Definition and concept, creep curve, mechanism of creep, impact of time and temperature on creep, creep fracture, creep testing and prevention against creep. Corrosion: Mechanism and effect of corrosion, prevention of corrosion.

Plastic, Composite and Ceramics: Polymers, formation of polymers, polymer structure and crystallinity, polymers to plastics types, reinforced particles-strengthened and dispersion strengthened composites. Ceramic materials: Types of ceramics, properties of ceramic, ceramic forming techniques, mechanical behavior of ceramic.

Text Books:

1. Elements of Material Science and Engineering: VanVlack, Wesley Pub. Comp.

2. Material Science - Narula, Narula and Gupta. New Age Publishers

Reference Books:

1. Material Science & Engineering –V. Raghvan, Prentice Hall of India Pvt. Ltd, New Delhi

2. A Text Book of Material Science & Metallurgy – O.P. Khanna, Dhanpat Rai & Sons

3. Material Science and Engineering-An Introduction - Callister; W.D., John Wiley & Sons. Delhi.

4. Engineering Materials: Kenneth G. Budinski, Prentice Hall of India, New Delhi

ME- 303F MECHANICAL MACHINE DESIGN -I

	Sessional : 50 Marks
L T P	Theory : 100 Marks
3 2 -	Total : 150 Marks
	Duration of Exam : 4 hrs.

Note: 1. Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

2. The paper setter will be required to mention in the note of the question paper that the use of following Design Data book is permitted:

(i) Design Data Handbook (In SI and Metric Units) for Mechanical Engineers by Mahadevan

(ii) Design Data Book PSG College of Technology Coimbatore

Section A

Design Philosophy: Problem identification- problem statement, specifications, constraints, Feasibility studytechnical feasibility, economic & financial feasibility, societal & environmental feasibility, Generation of solution field (solution variants), Brain storming, Preliminary design, Selection of best possible solution, Detailed design, Selection of Fits and tolerances and analysis of dimensional chains.

Selection of Materials: Classification of Engg. Materials, Mechanical properties of the commonly used engg. Materials, hardness, strength parameters with reference to stress-strain diagram, Factor of safety.

Section B

Mechanical Joints: ISO Metric Screw Threads, Bolted joints in tension, Eccentrically loaded bolted joints in shear and under combined stresses, Design of power screws, Design of various types of welding joints under different static load conditions.

Riveted Joints, Cotter & Knuckle Joints: Design of various types of riveted joints under different static loading conditions, eccentrically loaded riveted joints, design of cotter and knuckle joints.

Section C

Belt rope and chain drives: Design of belt drives, Flat & V-belt drives, Condition for Transmission of max. Power, Selection of belt, design of rope drives, design of chain drives with sprockets.

Keys, Couplings & Flywheel: Design of Keys – Flat, Kennedy Keys, Splines, Couplings design – Rigid & Flexible coupling, turning Moment diagram, coefficient of fluctuation of energy and speed, design of flywheel – solid disk & rimmed flywheels.

Section D

Clutches: Various types of clutches in use, Design of friction clutches – Disc. Multidisc, Cone & Centrifugal, Torque transmitting capacity.

Brakes: Various types of Brakes, Self energizing condition of brakes, Design of shoe brakes – Internal & external expanding, band brakes, Thermal Considerations in brake designing.

Text Books:

1. Mechanical Engg. Design - First Metric Editions: Joseph Edward Shigley-MGH, New York.
2. Design of Machine Elements – V.B. Bhandari – Tata McGraw Hill, New Delhi.
3. PSG Design Data Book

Reference Books :

1. Engineering design – George Dieter, MGH, New York.

2. Product Design and Manufacturing , A.K.Chitale and R.C.Gupta, PHI.
3. Machine Design An Integrated Approach: Robert L.Norton, Addison Wesley.
4. Machine Design : S.G. Kulkarini - Tata MacGraw Hill.
5. Design of machine elements-C S Sharma, Kamlesh Purohit, PHI.

ME- 309F MANUFACTURING TECHNOLOGY –II

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

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section A

Mechanism of Metal Cutting: Deformation of metal during machining, nomenclature of lathe, milling tools,mechanics of chip formation, built-up edges, mechanics of orthogonal and oblique cutting, Merchant cutting force circle and shear angle relationship in orthogonal cutting, factors affecting tool forces. Cutting speed, feed and depth of cut, surface finish. Temperature distribution at tool chip interface. Numerical on cutting forces and Merchant circle.

Cutting Tool Materials & Cutting Fluids: Characteristics of tool materials, various types of cutting tool materials, coated tools, cutting tool selection, Types of tool wear, tool life, factors governing tool life, Purpose and types of cutting fluids, basic actions of cutting fluids, effect of cutting fluid on tool life, selections of cutting fluid.

Section B

Unconventional Machining Processes: Abrasive jet machining: Principles, applications, process

parameters. Ultrasonic machining: Principles, applications, analysis of process parameters. Electro-chemical machining and grinding: Principles, classifications, choice of electrolytes, applications. Electric discharge machining: Principles, selection of tools materials and dielectric fluid. Electron beam machining: Generation of electron beam, relative merits and demerits. Laser beam machining: Principles and applications.

Jigs & Fixtures: Introduction, location and location devices, clamping and clamping devises, Drill Jigs, Milling Fixtures.

Section C

Numerical Control of Machine Tools; Introduction, Numerical Control & its growth, NC Machines tools, Axes of NC Machines, Classification of NC System, CNC, DNC and Machining Centre. Machine Control unit, NC tools & Tool changer.

Manual Part Programming; coordinate, Feed, Speed & Tool, Preparation & Miscellaneous functions, Examples of two axes part programming for Turning and Milling Operations.

Section D

Group Technology; Definition and concept, Group and Family, working of group technology, Stages for Adopting Group Technology, Advantages of Group Technology.

Component Classification and Coding, Personnel and Group Technology, Planning the introduction of Group Technology, Group Technology layout.

Text Books

1. Manufacturing Technology – Vol. - 2, P.N. Rao, T.M.H, New Delhi

2. Computer Aided Manufacturing: S Kumar & B Kant Khan, Satya Prakashan, New Delhi

Reference Books

1. Principles of Machine Tools – G.C. Sen & A. Bhattacharya, Tata McGraw Hill, New Delhi

2. Manufacturing Engg.& Tech, Kalpakian, Serope Addison -Wisly Publishing Co. New York.

3. Modern Machining Processes: P.C. Pandey & H.S. Shan, T.M.H. Company, New Delhi

4. Text Book of Production Engineering: P.C. Sharma, S.Chand & Sons.

5. Production Engineering by KC Jain & AK Chilate, PHI, New Delh

ME- 211F COMPUTER AIDED DESIGN LAB

L	T	P
-	-	2

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

The students will be required to carry out the following exercises using educational software (AutoCAD, I-DEAS, Pro-Engineer etc).

1. Setting up of drawing environment by setting drawing limits, drawing units, naming the drawing, naming layers, setting line types for different layers using various type of lines in engineering drawing, saving the file with .dwg extension.
2. Layout drawing of a building using different layer and line colors indicating all Building details. Name the details using text commands, Make a title Block.
3. To Draw Orthographic projection Drawings (Front, Top and side) of boiler safety valve giving name the various components of the valve.
4. Make an Isometric dimensioned drawing of a connecting Rod using isometric grid and snap.
5. Draw quarter sectional isometric view of a cotter joint.
6. Draw different types of bolts and nuts with internal and external threading in Acme and square threading standards. Save the bolts and nuts as blocks suitable for insertion.
7. Draw 3D models by extruding simple 2D objects, dimension and name the objects.
8. Draw a spiral by extruding a circle.

Note:-

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

2. At least five 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.

ME- 215F MATERIAL SCIENCE LAB.

	Sessional : 25 Marks
L T P	Practical Examination : 25 Marks
- - 2	Total : 50 Marks
	Duration of Exam: 3 Hrs

List of Experiments:

1. To study crystal structures of a given specimen.
2. To study crystal imperfections in a given specimen.
3. To study microstructures of metals/ alloys.
4. To prepare solidification curve for a given specimen.
5. To study heat treatment processes (hardening and tempering) of steel specimen.
6. To study microstructure of heat-treated steel.
7. To study thermo-setting of plastics.
8. To study the creep behavior of a given specimen.
9. To study the mechanism of chemical corrosion and its protection.
10. To study the properties of various types of plastics.
11. To study Bravais lattices with the help of models.
12. To study crystal structures and crystals imperfections using ball models.

Note:-

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

2. At least eight experiments should be performed from the above list.

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

ME- 319 F MANUFACTURING TECHNOLOGY –II LAB.

L T P
- - 2

Sessional marks : 25
Practical marks : 25
Total marks : 50
Duration of exam : 3 hrs

List of Experiments:

1 Study and Practice of Orthogonal & Oblique Cutting on a Lathe.
2 Machining time calculation and comparison with actual machining time while cylindrical turning on a Lathe and finding out cutting efficiency.
3 Study of Tool Life while Milling a component on the Milling Machine.
4 Study of Tool Wear of a cutting tool while Drilling on a Drilling Machine.
5 Study of Speed, Feed, Tool, Preparatory (Geometric) and Miscellaneous functions for N. C part programming.
6 Part Programming and proving on a NC lathe for:-
a. Outside Turning
b. Facing and Step Turning
c. Taper Turning
d. Drilling
e. Outside Threading
7 Part Programming and Proving on a NC Milling Machine:-
a. Point to Point Programming
b. Absolute Programming
c. Incremental Programming
8 Part Programming and Proving for Milling a Rectangular Slot.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 2ND YEAR MECHANICAL ENGINEERING, (PART TIME)
4th SEMESTER

EFFECTIVE FROM THE SESSION 2012-13

Course	Course Title	Teaching Schedule				Marks for Class Work	Marks for Examination		Total marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
ME-204-F	Kinematics of Machine	3	1		4	50	100	-	150	3
ME-208-F	Fluid Mechanics	3	1		4	50	100	-	150	3
ME-304-F	Mechanical Machine Design-II	3	2		5	50	100	-	150	4
ME-312-F	Industrial Engineering	3	1		4	50	100	-	150	3
ME-212-F	Kinematics of Machine Lab	-	-	2	2	25	-	25	50	3
ME-216-F	Fluid Mechanics Lab	-	-	2	2	25	-	25	50	3
GP-202-F	General Proficiency	-	-	2	2	50	-	-	50	-
	Total	12	5	6	23	300	400	50	750	

Note:
1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

ME-204F KINEMATICS OF MACHINE

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

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A

Introduction: mechanism and machines, kinematics links, kinematics pairs, kinematics chains, degree of freedom, Grubler's rule, kinematics inversion, equivalent linkages, four link planar mechanisms, straight line mechanisms, steering mechanisms, pantograph, problems.

Kinematics Analysis of Plane Mechanisms: displacement analysis, velocity diagram, velocity determination, relative velocity method, instantaneous center of velocity, Kennedy's theorem, graphical and analytical methods of velocity and acceleration analysis,problems.

Section-B

Cams: Classification of cams and followers, disc cam nomenclature, construction of displacement, velocity and acceleration diagrams for different types of follower motions, analysis of follower motions, determination of basic dimension, synthesis of cam profile by graphical methods, cams with specified contours, problems.

Gears: fundamental law of gearing, involute spur gears, characteristics of involute and cycloidal action, Interference and undercutting, center distance variation, path of contact, arc of contact, non standard gear teeth, helical, spiral bevel and worm gears, problems.

Section-C

Gear Trains: synthesis of simple, compound and reverted gear trains, analysis of epicylic gear trains, problems.

Kinematics synthesis of Mechanisms: function generation, path generation, Freudenstein's equation, two and three position synthesis of four bar and slider crank mechanisms by graphical

and analytical methods, , precision positions, structural error; Chebychev spacing, transmission angle, problems.

Section-D

Friction : Types of friction, laws of friction, motion along inclined plane, screw threads, efficiency on inclined plane, friction in journal bearing, friction circle and friction axis, pivots and collar friction, uniform pressure and uniform wear.

Belts and pulleys: Open and cross belt drive, velocity ratio, slip, material for belts, crowning of pulleys, law of belting, types of pulleys, length of belts, ratio of tension, centrifugal tension, power transmitted by belts and ropes, initial tension, creep, chain drives, chain length, classification of chains.

TEXT BOOKS:

1. Theory of Mechanisms and Machines: Amitabha Ghosh and Ashok kumar

Malik, Third Edition Affiliated East-West Press.

2. Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph

Uicker, Jr. Second Edition, MGH, New York.

REFERENCE BOOKS:

1. Mechanism and Machine Theory : J.S. Rao and R.V. Dukkipati Second Edition

New age International.

2. Theory and Machines: S.S. Rattan, Tata McGraw Hill.

ME-208F FLUID MECHANICS

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

NOTE: Examiner will set 9 questions in total, with two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal mark (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section-A

Fluid Properties and Fluid Statics: Concept of fluid and flow, ideal and real fluids, continuum concept, and properties of fluids, Newtonian and non-Newtonian fluids. Pascal's law, hydrostatic equation, hydrostatic forces on plane and curved surfaces, stability of floating and submerged bodies, relative equilibrium, Problems.

Fluid Kinematics: Eulerian and Lagrangian description of fluid flow; stream, streak and path lines; types of flows, flow rate and continuity equation, differential equation of continuity in cylindrical and polar coordinates, rotation, vorticity and circulation, stream and potential functions, flow net, Problems.

Section-B

Fluid Dynamics: Concept of system and control volume, Euler's equation, Bernoulli's equation, venturimeter, orifices, orificemeter, mouthpieces, kinetic and momentum correction factors, Impulse momentum relationship and its applications, Problems.

Compressible Fluid Flow: Introduction, continuity momentum and energy equation,sonic velocity, propagation of elastic waves due to compression of fluid, propagation of elastic waves due to disturbance in fluid, stagnation properties, isentropic flow, effect of area variation on flow properties, isentropic flow through nozzles,diffusers,injectors,Problems.

Section-C

Viscous Flow: Flow regimes and Reynolds's number, Relationship between shear stress and pressure gradient, uni-directional flow between stationary and moving parallel plates, movement of piston in a dashpot, power absorbed in bearings. Problems.

Flow Through Pipes: Major and minor losses in pipes, Hagen-Poiseuilli law, hydraulic gradient and total energy lines, series and parallel connection of pipes, branched pipes; equivalent pipe, power transmission through pipes, Problems.

Section-D

Boundary Layer Flow: Boundary layer concept, displacement, momentum and energy thickness, von-karman momentum integral equation, laminar and turbulent boundary layer flows, drag on a flat plate, boundary layer separation and control. Streamlined and bluffbodies lift and drag on a cylinder and an airfoil, Problems.

Turbulent Flow: Shear stress in turbulent flow, Prandtl mixing length hypothesis, hydraulically smooth and rough pipes, velocity distribution in pipes, friction coefficients for smooth and rough pipes, Problems.

TEXT BOOKS:

1. Fluid Mechanics – Streeter V L and Wylie E B, Mc Graw Hill

2. Mechanics of Fluids – I H Shames, Mc Graw Hill

REFERENCES BOOKS:

1. Introduction to Fluid Mechanics and Fluid Machines – S.K. Som and G.

Biswas, TMH

2. Fluid Mechanics and Fluid Power Engineering – D.S. Kumar, S.K. Kataria and Sons

3. Fluid Mechanics and Machinery – S.K. Agarwal, TMH, New Delhi

ME- 304F MECHANICAL MACHINE DESIGN –II

	Sessional : 50 Marks
L T P	Theory : 100 Marks
3 2 -	Total : 150 Marks
	Duration of Exam : 4 hrs.

1. Examiner will set 9 questions in total, two questions from each section and one question covering all sectionswhich will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20marks). Students have to attempt 5 questions in total at least one question from each section.
2. The paper setter will be required to mention in the note of the question paper that the use of following Design
Data book is permitted:
(i) Design Data Handbook (In SI and Metric Units) for Mechanical Engineers by Mahadevan
(ii) Design Data Book PSG College of Technology Coimbatore

Section A

Design for Production ; Erogonomic and value engineering considerations in design, Role of processing indesign, Design considerations for casting, forging and machining. Variable Loading : Different types of fluctuating/ variable stresses, Fatigue strength considering stress concentration factor, surface factor, size factor, reliability factor etc., Fatigue design for finite and infinite life against combined variable stresses using Goodman and Soderberg's Criterion, Fatigue design using Miner's equation, Problems.

Section B

Shafts : Detailed design of shafts for static and dynamic loading, Rigidity and deflection consideration.
Springs : Types of Springs, Design for helical springs against tension and their uses, compression and fluctuating loads, Design of leaf springs, Surging phenomenon in springs, Design Problem.

Section C

Bearings : design of pivot and collar bearing , Selection of ball and roller bearing based on static and dynamic load carrying capacity using load-life relationship, Selection of Bearings from manufacturer's catalogue, types of lubrication – Boundary, mixed and hydrodynamic lubrication, Design of journal bearings using Raimondi and Boyd's Charts, Lubricants and their properties, Selection of suitable lubricants, Design Problems.

Section D

Gears : Classification, Selection of gears, Terminology of gears, Force analysis, Selection of material for gears, Beam & wear strength of gear tooth, Form or Lewis factor for gear tooth, Dynamic load on gear teeth –Barth equation and Buckingham equation and their comparison, Design of spur, helical, bevel & worm gear including the Consideration for maximum power transmitting capacity, Gear Lubrication, Design Problems.

Text Books:

1. Mechanical Engg. Design- Joseph Edward Shigley-Mc Graw Hill Book Co.
2. Design of Machine Elements – V.B. Bhandari – Tata McGraw Hill, New Delhi.

Reference Books :

1. Engineering design – George Dieter, McGraw Hill, New York.
2. Product Design and Manufacturing –: A.K.Chitale and R.C.Gupta, PHI, New Delhi.
3. Machine Design An Integrated Approach: Robert L.Norton,Second Edition –Addison Wisley Longman
4. Machine Design : S.G. Kulkarni , TMH , N

ME- 312 F INDUSTRIAL ENGINEERING

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

Examiner will set 9 questions in total, two questions from each section and one question covering all sectionswhich will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section A

Definition of Industrial Engineering: Objectives, Method study, Principle of motion economy, Techniques ofmethod study - Various charts, THERBLIGS, Work measurement – various methods, time study PMTS,determining time, Work sampling, Numericals.
Productivity & Workforce Management :Productivity - Definition, Various methods of measurement,Factors effecting productivity, Strategies for improving productivity, Various methods of Job evaluation& merit rating, Various incentive payment schemes, Behavioural aspects, Financial incentives.

Section B

Manufacturing Cost Analysis: Fixed & variable costs, Direct, indirect & overhead costs, & Job costing,Recovery of overheads, Standard costing, Cost control, Cost variance Analysis -Labour, material, overhead involume, rate & efficiency, Break even Analysis, Marginal costing & contribution, Numericals.
Materials Management : Strategic importance of materials in manufacturing industries, Relevant costs, Inventorycontrol models - Economic order quantity (EOQ), Economic batch quantity (EBQ) with & without shortage,Purchase discounts, Sensitivity analysis, Inventory control systems - P,Q,Ss Systems, Service level, Stock outrisk, determination of order point & safety stock, Selective inventory control - ABC, FSN, SDE, VED and three dimensional, Numericals.

Section C

Quality Management: Definition of quality, Various approaches, Concept of quality assurance systems,Costs of quality, Statistical quality Control (SQC), Variables & Attributes, X, R, P & C - charts, Acceptancesampling, OC - curve, Concept of AOQL, Sampling plan - Single, Double & sequential, Introduction to TQM& ISO - 9000.
Production Planning & Control (PPC) : Introduction to Forecasting - Simple & Weighted moving average methods, Objectives & variables of PPC, Aggregate planning - Basic Concept, its relations with otherdecision areas, Decision options - Basic & mixed strategies, Master production schedule (MPS), SchedulingOperations Various methods for line & intermittent production systems, Gantt chart, Sequencing – Johnson algorithm for n-Jobs-2 machines, n-Jobs-3 machines, 2 Jobs n-machines, n-Jobs m-machines Various means of measuring effectiveness of PPC, Introduction to JIT, Numericals.

Section D

Management Information Systems (MIS) : What is MIS ? Importance of MIS, Organizational & information system structure, Role of MIS in decision making, Data flow diagram, Introduction to systems analysis & design, Organizing information systems.

Product Design and Development: Various Approaches, Product life cycle, Role 3S's – Standardization, Simplification, Specialization, Introduction to value engineering and analysis, Role of Ergonomics in Product Design.

Text Books: 1. Production & Operations Management - Chary, TMH, New Delhi.
2. Management Information Systems - Sadagopan, PHI New Delhi.
3. Modern Production Management – S.S. Buffa, Pub.- John Wiley.
Ref.Books: 1. Operations Management - Schroeder, McGraw Hill ISE.
2. Operation Management - Monks, McGraw Hill ISE.
3. Production & Operations Management - Martinich, John Wiely SE.
4. Industrial & Systems Engineering - Turner, MIZE, CHASE, Prentice Hall

ME-212F KINEMATICS OF MACHINES LAB

L T P	Sessional : 25 Marks
- - 2	Practical : 25 Marks
	Total : 50 Marks
	Duration of Exam: 3 Hrs

List of Experiments:

1. To study various types of Kinematic links, pairs, chains and Mechanisms.

2. To study inversions of 4 Bar Mechanisms, Single and double slider crank mechanisms.

3. To plot slider displacement, velocity and acceleration against crank rotation for single slider crank mechanism.

4. To find coefficient of friction between belt and pulley.

5. To study various type of cam and follower arrangements.

6. To plot follower displacement vs cam rotation for various Cam Follower systems.

7. To generate spur gear involute tooth profile using simulated gear shaping process.

8. To study various types of gears – Helical, cross helical worm, bevel gear.

9. To study various types of gear trains – simple, compound, reverted, epicyclic and differential.

10. To find co-efficient of friction between belt and pulley.

11. To study the working of Screw Jack and determine its efficiency.

12. Create various types of linkage mechanism in CAD and simulate for motion outputs and study the relevant effects.

13. Creation of various joints like revolute, planes, spherical, cam follower and study the degree of freedom and motion patterns available.

14. To design a cam profile by using the requirement graph using on-line engineering handbook and verify the same using a 3D mechanism on CAD.

Note: 1. At least Ten experiments are to be performed in the Semester.

2. At least eight experiments should be performed from the above list. However these experiments should include experiments at Sr. No. 12, 13 and 14. Remaining two experiments may either be performed from the above list or as designed & set by the concerned institution as per the scope of the syllabus.

ME-216F FLUID MECHANICS LAB

L T P	Sessional : 25 Marks
- - 2	Practical/Viva : 25 Marks
	Total : 50 Marks
	Duration of Exam. : 3 Hrs.

List of Experiments:

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

Note:

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

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

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 3RD YEAR MECHANICAL ENGINEERING, (PART TIME)
5TH SEMESTER

EFFECTIVE FROM THE SESSION 2012-13

Course	Course Title	Teaching Schedule				Marks for Class Work	Marks for Examination		Total marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
ME-301-F	Dynamics Of Machines	3	1	-	4	50	100	-	150	3
ME-305-F	Fluid Machine	3	1	-	4	50	100	-	150	3
ME-307-F	Internal Combustion Engines & Gas Turbines	3	1	-	4	50	100	-	150	3
ME-311-F	Applied Numerical Technique & Computing	3	-	-	3	50	100	-	150	3
ME-313-F	Dynamics Of Machines Lab	-	-	2	2	25		25	50	3
ME-315-F	Fluid Machine Lab	-	-	2	2	25		25	50	3
ME-317-F	Internal Combustion Engines & Gas Turbines Lab			2	2	25		25	50	3
ME-321-F	Applied Numerical Technique & Computing Lab	-	-	2	2	50			50	3
	Total	12	3	8	23	325	400	75	800	

Note:
1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

ME- 301F DYNAMICS OF MACHINES

Sessional : 50 Marks

Theory : 100 Marks

L T P

Total : 150 Marks

3 1 -

Duration of Exam : 3 Hrs.

Note: Examiner will set 9 questions in total, two questions from each section and one question covering allsections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section A

Static and Dynamic Force Analysis : Static force analysis of planer mechanisms, dynamic force analysis including inertia and frictional forces of planer mechanisms.

Dynamics of Reciprocating Engines : engine types, indicator diagrams, gas forces, equivalent masses, inertia forces, bearing loads in a single cylinder engine, crankshaft torque, engine shaking forces.

Section B

Balancing of Rotating Components : static balance, dynamic balance, balancing of rotating masses, two plane balancing, graphical and analytical methods, balancing of rotors, balancing machines, field balancing.

Balancing of Reciprocating Parts : Balancing of single cylinder engine, balancing of multi cylinder; inline, radial and V type engines, firing order.

Section C

Governors : introduction, types of governors, characteristics of centrifugal governors, gravity controlled andpring controlled centrifugal governors, hunting of centrifugal governors, inertia governors.

Dynamometers : types of dynamometers, Prony brake, rope brake and band brake dynamometers, belt transmission dynamometer, torsion dynamometer, hydraulic dynamometer.

Section D

Gyroscope : gyroscopes, gyroscopic forces and couples, gyroscopic stabilization, ship stabilization, stability of four wheel and two wheel vehicles moving on curved paths.

Text Books:

1. Theory of Mechanisms and Machines: Amitabha Ghosh and Ashok kumar Mallik, Third Edition Affiliated East-West Press.

2. Theory of Machine: S.S. Rattan, McGraw Hill Higher Education.

Reference Books:

1. Mechanism and Machine Theory: J.S. Rao and R.V. Dukkipati, New age International.

2 Theory of Machines and Mechanisms: Joseph Edward Shigley and John Joseph Uicker, Jr. Second Edition Mc Graw Hill, Inc

ME- 305F FLUID MACHINES

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

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section A

Impact of free jets: Impulse – momentum principle, jet impingement - on a stationary flat plate, inclined plate and a hinged plate, at the center of a stationary vane, on a moving flat plate, inclined plate, a moving vane and a series of vanes, Jet striking tangentially at the tip of a stationary vane and moving vane(s), jet propulsion of ships. Problems

Impulse Turbines: Classification – impulse and reaction turbines, water wheels, component parts, construction, operation and governing mechanism of a Pelton wheel, work done, effective head, available head and efficiency of a Pelton wheel, design aspects, speed ratio, flow ratio, jet ratio, number of jets, number of buckets and working proportions, Performance Characteristics, governing of impulse turbines. Problems

Section B

Francis Turbines: Component parts, construction and operation of a Francis turbine, governing mechanism, work done by the turbine runner, working proportions and design parameters, slow, medium and fast runners, degree of reaction, inward/outward flow reaction turbines, Performance Characteristics, Problems.

Propeller and Kaplan turbines: Component parts, construction and operation of a Propeller, Kaplan turbine, differences between the Francis and Kaplan turbines, draft tube - its function and different forms, Performance Characteristics, Governing of reaction turbine, Introduction to new types of turbine, Deriaz (Diagonal), Bulb, Tubular turbines, Problems.

Section C

Dimensional Analysis and Model Similitude: Dimensional homogeneity, Rayleigh’s method and Buckingham’s -theorem, model studies and similitude, dimensionless numbers and their significance. Unit quantities, specific speed and model relationships for turbines, scale effect, cavitations – its causes, harmful effects and prevention, Thomas cavitation factor, permissible installation height, Problems.

Centrifugal Pumps: Classification, velocity vector diagrams and work done, manometric efficiency, vane shape, head capacity relationship and pump losses, pressure rise in impeller, minimum starting speed, design considerations, multi-stage pumps. Similarity relations and specific speed, net positive suction head, cavitation and maximum suction lift, performance characteristics. Brief introduction to axial flow, mixed flow and submersible pumps, Problems.

Section D

Reciprocating Pumps: Construction and operational details, discharge coefficient, volumetric efficiency and slip, work and power input, effect of acceleration and friction on indicator diagram (pressure – stroke length plot), separation, air vessels and their utility, rate of flow into or from the air vessel, maximum speed of the rotating crank, characteristic curves, centrifugal vs reciprocating pumps, brief introduction to screw, gear, vane and radial piston pumps, Problems.

Hydraulic systems: Function, construction and operation of Hydraulic accumulator, hydraulic intensifier, hydraulic crane, hydraulic lift and hydraulic press, Fluid coupling and torque converter, Hydraulic ram, Problems.

Text Books :

- Hydraulics & Fluid Mechanics – Modi & Seth, Pub. - Standard Book House, N.Delhi
- Hydraulic Machines – Jagdish Lal, Metropolitan

Reference Books :

Fluid Mechanics and Hydraulic Machines – S S Rattan, Khanna Publishers

Introduction to Fluid Mechanics and Fluid Machines – S K Som and G Biswas, Tata McGraw Hill

Fluid Mechanics and Fluid Power Engineering – D S Kumar, S K Kataria and Sons

ME- 307F INTERNAL COMBUSTION ENGINES & GAS TURBINES

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

Note: Examiner will set 9 questions in total, two questions from each section and one question covering allsections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks(20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section A

Air Standard Cycles: Internal and external combustion engines; classification of I.C. Engines, Cycles of operation in four stroke and two stroke I.C. Engines, Wankel Engines, Assumptions made in air standard cycle; 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. Problems.

Carburetion, fuel Injection and Ignition systems: Mixture requirements for various operating conditions in S.I.Engines; elementary carburetor, Requirements of a diesel injection system; types of inject systems; petrol injection, Requirements of ignition system; types of ignition systems ignition timing; spark plugs. Problems.

Section B

Combustion in I.C. Engines : 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.

Lubrication and Cooling Systems: 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.

Section C

Engine Testing and Performance: Performance parameters: BHP, IHP, mechanical efficiency, brake mean effective pressure and indicative mean effective pressure, torque, volumetric efficiency; specific fuel consumption (BSFC, 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. Problems.

Air pollution from I.C. Engine and Its remedies: 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.

Section D

Rotary Compressors: Root and vane blowers; Static and total head values; Centrifugal compressors- Velocity diagrams, slip factor, ratio of compression, pressure coefficient, pre-whirl; Axial flow compressor- Degree of reaction, polytropic efficincy, surging, choking and stalling, performance characteristics, Problems.

Gas Turbines: 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, Applications of gas turbines.

Problems.

Text Books: 1. Internal Combustion Engines –V. Ganesan, Pub.-Tata McGraw-Hill.

2.Gas Turbines - V. Ganesan, Pub.- Tata McGraw Hill.

3. Engineering fundamental of the I.C.Engine – Willard W. Pulkrabek Pub.-PHI,India

Reference Books:

1. Internal Combustion Engines & Air pollution- Obert E.F, Pub.-Hopper & Row Pub., New York
2.Internal Combustion Engines Fundamentals- John B. Heywood, Pub.-McGraw Hill, New York
3. Fundamentals of Internal Combustion Engines-H.N. Gupta, PHI, New Delhi

ME –311F APPLIED NUMERICAL TECHNIQUES AND COMPUTING

L T P	Sessional marks : 50
3 -1 -	Theory marks : 100
	Total marks : 150

Duration of exam : 3 hrs

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section A

ERRORS IN NUMERICAL CALCULATIONS Introduction, Numbers and their accuracy, Absolute, relative and percentage errors and their analysis, General error formula.

INTERPOLATION AND CURVE FITTING Taylor series and calculation of functions, Introduction to interpolation, Lagrange approximation, Newton Polynomials, Chebyshev Polynomials, Least squares line, curve fitting, Interpolation by spline functions.

Section B

NUMERICAL DIFFERENTIATION AND INTEGRATION Approximating the derivative, Numerical differentiation formulas, Introduction to Numerical quadrature, Newton-Cotes formula, Gaussion Quadrature.

SOLUTION OF NONLINEAR EQUATIONS Bracketing methods for locating a root, Initial approximations and convergence criteria, Newton- Raphson and Secant methods, Solution of problems through a structural programming language such as C or Pascal.

Section C

SOLUTION OF LINEAR SYSTEMS Direct Methods, Gaussian elimination and pivoting, Matrix inversion, UV factorization, Iterative methods for linear systems, Solution of problems through a structured programming language such as C or Pascal.

EIGEN VALUE PROBLEMS Jacobi, Given's and Householder's methods for symmetric matrices, Rutishauser method for general matrices, Power and inverse power methods.

Section D

SOLUTION OF DIFFERENTIAL EQUATIONS Introduction to differential equations, Initial value problems, Euler's methods, Heun's method, Runge-Kutta methods, Taylor series method, Predictor-Corrector methods, Systems of differential equations, Boundary valve problems, Finite-difference method, Solution of problems through a structured programming language such as C or Pascal.

PARTIAL DIFFERENTIAL EQUATIONS, EIGENVALUES AND EIGENVECTORS Solution of hyperbolic, parabolic and elliptic equations, The eigenvalue problem, The power method and the Jacobi's method for eigen value problems, Solution of problems through a structural programming language such as C or Pascal.

Text Books:

1. Numerical Methods for Mathematics, Science and Engineering by John H.Mathews, PHI New Delhi.

2. Applied Numerical Methods – Carnahan, B.H., Luthar, H.A. and Wilkes, J.O., Pub.- J. Wiley, New York

Reference Books:

1. Numerical Solution of Differential Equations, by M.K. Jain, Published by Wiley Eastern, New York.

2. Introductory Methods of Numerical Analysis by S.D. Sastry, Published by Prentice Hall of India.

3. Numerical Methods – Hornbeck, R.W. , Pub.- Prentice Hall, Englewood Cliffs, N.J

ME- 313F DYNAMICS OF MACHINE LAB

	Sessional : 25 Marks
L T P	Practical : 25 Marks
- - 2	Total : 50Marks
	Duration of Exam : 3 hrs.

List of Experiments :

1. To perform experiment on Watt and Porter Governors to prepare performance characteristic Curves, and to find stability & sensitivity.

2. To perform experiment on Proell Governor to prepare performance characteristic curves, and to find stability & sensitivity.

3. To perform experiment on Hartnell Governor to prepare performance characteristic Curves, and to find stability & sensitivity.

4. To study gyroscopic effects through models.

5. To determine gyroscopic couple on Motorized Gyroscope.

6. To perform the experiment for static balancing on static balancing machine.

7. To perform the experiment for dynamic balancing on dynamic balancing machine.

8. Determine the moment of inertial of connecting rod by compound pendulum method and tri-flair suspension pendulum.

Note : 1. Ten experiments are to be performed in the Semester.

2. At least seven experiments should be performed from the above list. Remaining three experiments should be performed as designed & set by the concerned Institution as per the scope of the syllabus.

ME- 315 F FLUID MACHINES LAB.

L T P	Sessional : 25 Marks
- - 2	Practical : 25 Marks
	Total : 50 Marks
	Duration of Exam.: 3 Hrs.

List of Experiments :

1. To study the constructional details of a Pelton turbine and draw its fluid flow circuit.
2. To draw the following performance characteristics of Pelton turbine-constant head, constantspeed and constant efficiency curves.
3. To study the constructional details of a Francis turbine and draw its fluid flow circuit.
4. To draw the constant head, constant speed and constant efficiency performance characteristics of Francis turbine.
5. To study the construction details of a Kaplan turbine and draw its fluid flow circuit.
6. To draw the constant head, speed and efficiency curves for a Kaplan turbine.
7. To study the constructional details of a Centrifugal Pump and draw its characteristic curves.
8. To study the constructional details of a Reciprocating Pump and draw its characteristics curves.
9. To study the construction details of a Gear oil pump and its performance curves.
10. To study the constructional details of a Hydraulic Ram and determine its various efficiencies..
11. To study the constructional details of a Centrifugal compressor.
12. To study the model of Hydro power plant and draw its layout.

NOTE : 1. At least ten experiments are to be performed in the Semester.

2. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus

ME- 317F I.C. ENGINES & GAS TURBINES LAB

	Sessional : 25 Marks
	Practical : 25 Marks
L T P	Total : 50 Marks
- - 2	Duration of Exam. : 3 Hrs.

List of Experiments :

1. To study the constructional details & working principles of two-stroke/ four stroke petrol engine.
2. To study the constructional detail & working of two-stroke/ four stroke diesel engine.
3. Analysis of exhaust gases from single cylinder/multi cylinder diesel/petrol engine by Orsat Apparatus.
4. To prepare heat balance sheet on multi-cylinder diesel engine/petrol engine.
5. To find the indicated horse power (IHP) on multi-cylinder petrol engine/diesel engine by Morse Test.
6. To prepare variable speed performance test of a multi-cylinder/single cylinder petrol engine/diesel engine and prepare the curves (i) bhp, ihp,fhp, vs speed (ii) volumetric efficiency & indicated specific specific fuel consumption vs speed.
7. To find fhp of a multi-cylinder diesel engine/petrol engine by Willian's line method & by motoring method.
8. To perform constant speed performance test on a single cylinder/multi-cylinder diesel engine & draw
curves of (i) bhp vs fuel rate, air rate and A/F and (ii) bhp vs mep, mech efficiency & sfc.
9. To measure CO & Hydrocarbons in the exhaust of 2- stroke / 4-stroke petrol engine.
10. To find intensity of smoke from a single cylinder / multi-cylinder diesel engine.
11. To draw the scavenging characteristic curves of single cylinder petrol engine.
12. To study the effects of secondary air flow on bhp, sfc, Mech. Efficiency & emission of a two-stroke petrol engine.

NOTE:
1. At least ten experiments are to be performed in the Semester.
2. At least seven experiments should be performed from the above list. Remaining three experiments
may either be performed from the above list or designed & set by the concerned institution as per the scope of the syllabus.

ME- 321F APPLIED NUMERICAL TECHNIQUES AND COMPUTING LAB

L T P	Sessional marks : 5
- - 2	Practical marks : -
	Total marks : -50
	Duration of exam : 2 hrs

The students will be required to carry out the following exercises, that are based on the theory course ME-311F Numerical Methods and Computing, with the help of MATLAB software / Pascal / C / C++ on personal computer.

1. Solution of Non-linear equation in single variable using the method of successive bisection.
2. Solution of Non-Linear equation in single variable using the Newton Raphson, Secant, Bi – Section and Modified Eualer's, method.
3. Solution of a system of simultaneous algebraic equations using the Gaussian elimination procedure.
4. Solution of a system of simultaneous algebraic equations using the Gauss-Seidel iterative method.
5. Solution of a system of simultaneous algebraic equations using the Gauss-Seidel iterative method employing the technique of successive relaxation.
6. Numerical solution of an ordinary differential equation using the Euler's method.
7. Numerical solution of an ordinary differential equation using the Runge - Kutta 4^{th} order method.
8. Numerical solution of an ordinary differential equation using the Predictor – corrector method.
9. Numerical solution of a system of two ordinary differential equation using Numerical integration.
10. Numerical solution of an elleptic boundary value problem using the method of Finite Differences.

MAHARSHI DAYANAND UNIVERSITY, ROHTAK
SCHEME OF STUDIES & EXAMINATIONS
B.Tech 3RD YEAR MECHANICAL ENGINEERING, (PART TIME)
6TH SEMESTER

EFFECTIVE FROM THE SESSION 2012-13

Course	Course Title	Teaching Schedule				Marks for Class Work	Marks for Examination		Total marks	Duration of Exam
		L	T	P	Total		Theory	Practical		
ME-302-F	Automobile Engineering	3	1	-	4	50	100	-	150	3
ME-306-F	Heat Transfer	3	1	-	4	50	100	-	150	3
ME-308-F	Automatic Control	3	1	-	4	50	100	-	150	3
ME-310-F	Measurement & instrumentation	3	1	-	4	50	100	-	150	3
ME-314-F	Automobile Engineering Lab	-	-	2	2	25	-	25	50	3
ME-316-F	Heat Transfer Lab	-	-	2	2	25	-	25	50	3
ME-318-F	Measurement & instrumentation Lab	-	-	2	2	25	-	25	50	3
ME-320-F	General Proficiency	-	-	2	2	50	-		50	
	Total	12	4	8	24	325	400	75	800	

Note:
1) Students will be allowed to use non-programmable scientific calculator. However, sharing of calculator will not be permitted in the examination.

ME-302F AUTOMOBILE ENGINEERING

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

Note: Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.

Section A

Introduction to Automobiles : Classification, Components, Requirements of Automobile Body; Vehicle Frame, Separate Body & Frame, Unitised Body, Car Body Styles, Bus Body & Commercial Vehicle Body Types; Front Engine Rear Drive & Front Engine Front Drive Vehicles, Four Wheel Drive Vehicles, Safety considerations; Safety features of latest vehicle; Future trends in automobiles.
Clutches : Requirement of Clutches – Principle of Friction Clutch – Wet Type & Dry Types; Cone Clutch, Single Plate Clutch, Diaphragm Spring Clutch, Multi plate Clutch, Centrifugal Clutches, Electromagnetic Clutch, Over Running Clutch; Clutch Linkages.

Section B

Power Transmission: Requirements of transmission system; General Arrangement of Power Transmission system; Object of the Gear Box; Different types of Gear Boxes; Sliding Mesh, Constant Mesh, Synchro- mesh Gear Boxes; Epi-cyclic Gear Box, Freewheel Unit. Overdrive unit-Principle of Overdrive, Advantage of Overdrive, Transaxle, Transfer cases.
Drive Lines, Universal Joint, Differential and Drive Axles: Effect of driving thrust and torque reactions; Hotchkiss Drive, Torque Tube Drive and radius Rods; Propeller Shaft, Universal Joints, Slip Joint; Constant Velocity Universal Joints; Front Wheel Drive; Principle, Function, Construction & Operation of Differential; Rear Axles, Types of load coming on Rear Axles, Full Floating, Three quarter Floating and Semi Floating Rear Axles.

Section C

Suspension Systems : Need of Suspension System, Types of Suspension; factors influencing ride comfort, Suspension Spring; Constructional details and characteristics of leaf springs.
Steering System : Front Wheel geometry & Wheel alignment viz. Caster, Camber, King pin Inclination, Toein/ Toe-out; Conditions for true rolling motions of Wheels during steering; Different types of Steering Gear Boxes; Steering linkages and layout; Power steering – Rack & Pinion Power Steering Gear, Electronics steering.

Section D

Automotive Brakes, Tyres & Wheels : Classification of Brakes; Principle and constructional details of Drum Brakes, Disc Brakes; Brake actuating systems; Mechanical, Hydraulic, Pneumatic Brakes; Factors affecting Brake performance, Power & Power Assisted Brakes; Tyres of Wheels; Types of Tyre & their constructional details, Wheel Balancing, Tyre Rotation; Types of Tyre wear & their causes.
Emission Control System & Automotive Electrical : Sources of Atmospheric Pollution from the automobile, Emission Control Systems – Construction and Operation of Positive Crank Case Ventilation (PVC) Systems, Evaporative Emission Control, Heated Air Intake System, Exhaust Gas Recirculation (ECR) Systems, Air Injection System and Catalytic Converters; Purpose construction & operation of lead acid Battery, Capacity
Rating & Maintenance of Batteries; Purpose and Operation of Charging Systems, Purpose and Operations of the Starting System; Vehicle Lighting System.

Text Books:

1. Automobile Engineering by Anil Chhikara, Satya Prakashan, New Delhi.
2. Automobile Engineering by Dr. Kirpal Singh, standard Publishers Distributors.

Reference Books:

1. Automotive Mechanics – Crouse / Anglin, TMH.
2. Automotive Technology – H.M. Sethi, TMH, New Delhi.
3. Automotive Mechanics – S.Srinivasan, TMH, New Delhi.
4. Automotive Mechanics – Joseph Heitner, EWP.
5. Motor Automotive Technology by Anthony E. Schwaller – Delmer Publishers, Inc.
6. The Motor Vehicle – Newton steeds Garrett, Butter Worths.

ME –306F HEAT TRANSFER

L T P
3 1 -

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

Note:
1. Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20 marks). Students have to attempt 5 questions in total at least one question from each section.
2. The paper setter will be required to mention in the note of question paper that the use of Steam tables, Charts, Graphical plots is permitted.

Section A

Basics and Laws : Definition of Heat Transfer, Reversible and irreversible processes, Modes of heat flow, Combined heat transfer system and law of energy conservation.
Steady State Heat Conduction : Introduction, I-D heat conduction through a plane wall, long hollow cylinder, hollow sphere, Conduction equation in Cartesian, polar and spherical co-ordinate systems, Numericals.

Section B

Steady State Conduction with Heat Generation : Introduction, 1 – D heat conduction with heat sources, Extended surfaces (fins), Fin effectiveness 2-D heat conduction , Numericals.
Transient Heat Conduction : Systems with negligible internal resistance, Transient heat conduction in plane walls, cylinders, spheres with convective boundary conditions, Chart solution, Relaxation Method, Numericals.

Section C

Convection: Forced convection-Thermal and hydro-dynamic boundary layers, Equation of continuity, Momentum and energy equations, Some results for flow over a flat plate and flow through tube, Fluid friction and heat transfer (Colburn analogy), Free convection from a vertical flat plate, Empirical relations for free convection from vertical and horizontal o\planes & cylinders, Numericals.
Thermal Radiation: The Stephen-Boltzmann law, The black body radiation, Shape factors and their relationships, Heat exchange between non black bodies, Electrical network for radiative exchange in an enclosure of two or three gray bodies, Radiation shields, Numericals.

Section D

Heat Exchangers: Classification, Performance variables, Analysis of a parallel/counter flow heat exchanger, Heat exchanger effectiveness, Numericals.
Heat Transfer with Change of Phase: Laminar film condensation on a vertical plate, Drop-wise condensation, Boiling regimes, Free convective, Nucleate and film boiling, Numericals.

Text Books :

1. Heat Transfer – J.P. Holman, John Wiley & Sons, New York.
2. Fundamentals of Heat & Mass Transfer–Incropera, F.P. & Dewill, D.P –John Willey New York.
3. Heat Transfer-Principles & Applications-Binay K. Dutta, PHI, New Delhi

Reference Books :

1. Conduction of Heat in Solids – Carslow, H.S. and J.C. Jaeger – Oxford Univ. Press.
2. Conduction Heat Transfer – Arpasi, V.S. – Addison – Wesley.
3. Compact Heat Exchangers – W.M. Keys & A.L. Landon, Mc. Graw Hill.
4. Thermal Radiation Heat Transfer – Siegel, R. and J.R. Howell, Mc. Graw Hill.
5. Heat Transmission – W.M., Mc.Adams , Mc Graw Hill.

ME- 308F AUTOMATIC CONTROLS

L T P
3 1 -

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

Examiner will set 9 questions in total, two questions from each section and one question covering all sectionswhich will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20marks). Students have to attempt 5 questions in total at least one question from each section.

Section A

Introduction And Applications: Types of control systems ; Typical Block Diagram : Performance Analysis; Applications – Machine Tool Control, Boiler Control, Engine Governing, Aerospace Control, Active Vibration Control; Representation of Processes & Control Elements – Mathematical Modeling. Block Diagram Representation, Representation of Systems or Processes, Comparison Elements; Representation of Feedback Control systems – Block Diagram & Transfer Function Representation, Representation of a Temperature, Control System, Signal Flow Graphs, Problems.
Types of Controllers : Introduction : Types of Control Action; Hydraulic Controllers; Electronic Controllers; Pneumatic Controllers; Problems.

Section B

Transient And Steady State Response: Time Domain Representation; Laplace Transform Representation; System with Proportional Control; Proportional – cum – Derivative control; Proportional – cum – Integral Control; Error Constants; Problems. Frequency Response Analysis: Introduction; Closed and Open Loop Transfer Function; Polar Plots; Rectangular
Plots; Nichols Plots: Equivalent Unity Feed Back Systems; Problems.

Section C

Stability Of Control Systems : Introduction; Characteristic Equation; Routh's Criterion; Nyquists Criterion, Gain & Phase Margins: Problems.
Root Locus Method : Introduction; Root Ioci of a Second Order System; General Case; Rules for Drawing Forms of Root Ioci; Relation between Root Locus Locations and Transient Response; Parametric Variation; Problems.

Section D

Digital Control System : Introduction; Representation of Sampled Signal; Hold Device; Pulse Transfer Function; Block Diagrams; Transient Response; Routh's Stability Criterion; Root Locus Method; Nyquists Criterion; Problems.
State Space Analysis Of Control Systems: Introduction; Generalized State Equation; Techniques for Deriving System State – Space Equations; Transfer Function from State Equations; Solution of State Vector Differential Equations; Discrete Systems; Problems.

Text Books :

1. Theory & Applications of Automatic Controls by B.C. Nakra, Published by New Age International Pvt. Ltd. Publishers, New Delhi.
2. Modern Control Engg. by Ugata, Prentice Hall of India, New Delhi.

Reference Books :

1. Automatic Control Systems by Kuo' Published by Prentice Hall of India, New Delhi.
2. Control System Engineering, I. J. Nagrath and M. Gopal, New Age , New Delhi.

ME – 310F MEASUREMENTS AND INSTRUMENTATION

L T P
3 1 -

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

Examiner will set 9 questions in total, two questions from each section and one question covering all sections which will be Q.1. This Q.1 is compulsory and of short answers type. Each question carries equal marks (20marks). Students have to attempt 5 questions in total at least one question from each section.

Section A

Instruments and Their Representation : Introduction, Typical Applications of Instrument Systems, Functional Elements of a Measurement System, Classification of Instruments, Standards and Calibration.

Static and Dynamic characteristics of Instruments : Introduction, Accuracy, Precision, Resolution, Threshold, Sensitivity, Linearity, Hysteresis, Dead Band, Backlash, Drift, Formulation of Differential Equations for Dynamic Performance- Zero Order, First Order and Second order systems, Response of First and Second Order Systems to Step, Ramp, Impulse and Harmonic Functions.

Section B

Transducer Elements : Introduction, Analog and Digital Transducers, Electromechanical; Potentiometric, Inductive Self Generating and Non-Self Generating Types, Electromagnetic, Electrodynamic, Eddy Current, Magnetostrictive, Variable Inductance, Linearly Variable Differential Transformer, Variable Capacitance, Piezo- Electric Transducer and Associated Circuits, Unbonded and Bonded Resistance Strain Gages. Strain Gage Bridge circuits, Single Double and Four Active Arm Bridge Arrangements, Temperature Compensation, Balancing and Calibration, Ionisation Transducers, Mechano Electronic Transducers, Opto-Electrical Transducers, Photo Conductive Transducers, Photo Volatic Transducers, Digital Transducers, Frequency Domain Transducer, Vibrating String Transducer, Binary codes, Digital Encoders.

Section C

Motion, Force and Torque Measurement : Introduction, Relative motion Measuring Devices, Electromechanical, Optical, Photo Electric, Moire-Fringe, Pneumatic, Absolute Motion Devices, Seismic Devices, Spring Mass & Force Balance Type, Calibration, Hydraulic Load Cell, Pneumatic Load Cell, Elastic Force Devices, Separation of Force Components, Electro Mechanical Methods, Strain Gage, Torque Transducer, Toque Meter. Intermediate, Indicating and Recording Elements : Introduction Amplifiers, Mechanical, Hydraulic, Pneumatic,
Optical, Electrical Amplifying elements, Compensators, Differentiating and Integrating Elements,

Section D

Pressure and Flow Measurement : Pressure & Flow Measurement, Introduction : Moderate Pressure Measurement, Monometers, Elastic Transducer, Dynamic Effects of Connecting Tubing, High Pressure Transducer, Low Pressure Measurement, Calibration and Testing, Quantity Meters, Positive Displacement Meters, Flow Rate Meters, Variable Head Meters, Variable Area Meters, Rotameters, Pitot-Static Tube Meter, Drag Force Flow Meter, Turbine Flow Meter, Electronic Flow Meter, Electro Magnetic Flow meter. Hot-Wire
Anemometer.

Temperature Measurement : Introduction, Measurement of Temperature, Non Electrical Methods – Solid Rod Thermometer, Bimetallic Thermometer, Liquid-in-Glass thermometer, Pressure Thermometer, Electrical Methods – Electrical Resistance Thermometers, Semiconductor Resistance Sensors (Thermistors), Thermo–Electric Sensors, Thermocouple Materials, Radiation Methods (Pyrometry), Total Radiation Pyrometer, Selective Radiation Pyrometer.

Text Books :

1. Measurement systems Application and Design. Ernest O. Doebelin, Tata McGraw Hill Edition (Fourth Edition) 2002.
2. Measurement and Instrumentation in Engineering, Francis S. Tse and Ivan E. Morse, Marcel Dekker.

Reference Books :

1. Principles of Measurement and Instrumentation – Alan S. Morris Prentice Hall of India.
2. Mechanical Measurements : T.G. Beckwith, W.L. Buck and R.D. Marangoni Addison Wesley.
3. Instrumentation, Measurement and Analysis – B.C. Nakra and K.K. Chaudhary, TMH.
4. Mechanical Measurements by D. S. Kumar, Kataria & Sons.

ME- 314 F AUTOMOBILE ENGINEERING LAB

L	T	P
-	-	2

Sessional : 25 Marks
Practical : 25 Marks
Total : 50Marks
Duration of Exam : 3 hrs.

List of Experiments :

1. To study and prepare report on the constructional details, working principles and operation of the following Automotive Engine Systems & Sub Systems.
(a) Multi-cylinder : Diesel and Petrol Engines.
(b) Engine cooling & lubricating Systems.
(c) Engine starting Systems.
(d) Contact Point & Electronic Ignition Systems.
2. To study and prepare report on the constructional details, working principles and operation of the following Fuels supply systems:
(a) Carburetors
(b) Diesel Fuel Injection Systems
(c) Gasoline Fuel Injection Systems.
3. . To study and prepare report on the constructional details, working principles and operation of the following Automotive Clutches.
(a) Coil-Spring Clutch
(b) Diaphragm – Spring Clutch.
(c) Double Disk Clutch.
4. To study and prepare report on the constructional details, working principles and operation of the following Automotive Transmission systems.
(a) Synchromesh – Four speed Range.
(b) Transaxle with Dual Speed Range.
(c) Four Wheel Drive and Transfer Case.
(d) Steering Column and Floor – Shift levers.
5. To study and prepare report on the constructional details, working principles and operation of the following Automotive Drive Lines & Differentials.
(a) Rear Wheel Drive Line.
(b) Front Wheel Drive Line.
(c) Differentials, Drive Axles and Four Wheel Drive Line.
6. To study and prepare report on the constructional details, working principles and operation of the following Automotive Suspension Systems.
(a) Front Suspension System.
(b) Rear Suspension System.
7. To study and prepare report on the constructional details, working principles and operation of the following Automotive Steering Systems.
(a) Manual Steering Systems, e.g. Pitman –arm steering, Rack & Pinion steering.
(b) Power steering Systems, e.g. Rack and Pinion Power Steering System.
(c) Steering Wheels and Columns e.g. Tilt & Telescopic steering Wheels, Collapsible Steering Columns.
8. To study and prepare report on the constructional details, working principles and operation of the following Automotive Tyres & wheels.
(a) Various Types of Bias & Radial Tyres.
(b) Various Types of wheels.
9. To study and prepare report on the constructional details, working principles and operation of the Automotive Brake systems.

(a) Hydraulic & Pneumatic Brake systems.
(b) Drum Brake System.
(c) Disk Brake System.
(d) Antilock Brake System.
(e) System Packing & Other Brakes.
10. To study and prepare report on the constructional details, working principles and operation of Automotive Emission / Pollution control systems.
11. Modeling of any two automotive systems on 3D CAD using educational softwares (eg. 3D modeling package/Pro Engineering/I-Deas/ Solid edge etc.)
12. Crash worthiness of the designed frame using Hypermesh and LS-Dyna solver or other software.

NOTE : 1. At least ten experiments are to be performed in the Semester.
2. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or as designed & set by the concerned institution as per the scope of the syllabus.

ME- 316F HEAT TRANSFER LAB.

L T P	Sessional : 25 Marks
- - 2	Practical : 25 Marks
	Total : 50 Marks
	Duration of Exam : 3Hrs.

List of Experiments :

1. To determine the thermal conductivity of a metallic rod.
2. To determine the thermal conductivity of an insulating power.
3. To determine the thermal conductivity of a solid by the guarded hot plate method.
4. To find the effectiveness of a pin fin in a rectangular duct natural convective condition and plot temperature distribution along its length.
5. To find the effectiveness of a pin fin in a rectangular duct under forced convective and plot temperature distribution along its length.
6. To determine the surface heat transfer coefficient for a heated vertical tube under natural convection and plot the variation of local heat transfer coefficient along the length of the tube. Also compare the results with those of the correlation.
7. To determine average heat transfer coefficient for a externally heated horizontal pipe under forced convection & plot Reynolds and Nusselt numbers along the length of pipe. Also compare the results with those of the correlations.
8. To measure the emmisivity of the gray body (plate) at different temperature and plot the variation of emmisivity with surface temperature.
9. To find overall heat transfer coefficient and effectiveness of a heat exchange under parallel and counter flow conditions. Also plot the temperature distribution in both the cases along the length of heat of heat exchanger.
10. To verify the Stefen-Boltzmann constant for thermal radiation.
11. To demonstrate the super thermal conducting heat pipe and compare its working with that of the best conductor i.e. copper pipe. Also plot temperature variation along the length with time or three pipes.
12. To study the two phases heat transfer unit.
13. To determine the water side overall heat transfer coefficient on a cross-flow heat exchanger.
14. Design of Heat exchanger using CAD and verification using thermal analysis package eg. I-Deas etc.

Note:

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

2. At least seven experiments should be performed from the above list. Remaining three experiments

may either be performed from the above list or designed & set by the concerned institute as per the scope of the syllabus.

ME- 318F MEASUREMENTS & INSTRUMENTATION LAB.

L	T	P
-	-	2

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

List of Experiments :

1. To Study various Temperature Measuring Instruments and to Estimate their Response times.
(a) Mercury – in glass thermometer
(b) Thermocouple
(c) Electrical resistance thermometer
(d) Bio-metallic strip
2. To study the working of Bourdon Pressure Gauge and to check the calibration of the gauge in a deadweight pressure gauge calibration set up.
3. To study a Linear Variable Differential Transformer (LVDT) and use it in a simple experimental set up to measure a small displacement.
4. To study the characteristics of a pneumatic displacement gauge.
5. To measure load (tensile/compressive) using load cell on a tutor.
6. To measure torque of a rotating shaft using torsion meter/strain gauge torque transducer.
7. To measure the speed of a motor shaft with the help of non-contact type pick-ups (magnetic or photoelectric).
8. To measure the stress & strain using strain gauges mounted on simply supported beam/cantilever beam.
9. To measure static/dynamic pressure of fluid in pipe/tube using pressure transducer/pressure cell.
10. To test experimental data for Normal Distribution using Chi Square test.
11. To learn the methodology of pictorial representation of experimental data and subsequent calculations for obtaining various measures of true value and the precision of measurement using Data acquisition system/ calculator.
12. Vibration measurement by Dual Trace Digital storage Oscilloscope.
13. To find out transmission losses by a given transmission line by applying capacitive /inductive load.
14. Process Simulator.

Note:
1. At least ten experiments are to be performed in the Semester.
2. At least seven experiments should be performed from the above list. Remaining three experiments may either be performed from the above list or designed & set by the concerned institution as per the scope of the Syllabus.