

Scheme – 2013

Department of Mechanical Engineering G. Pulla Reddy Engineering College (Autonomous): Kurnool Accredited by NBA of AICTE and NAAC of UGC Affiliated to JNTUA, Anantapuramu

G. PULLA REDDY ENGINEERING COLLEGE (Autonomous) : KURNOOL

Four year B.Tech Course (Scheme - 13)

Scheme of instruction and Examination (Effective from 2013-14)

Proposed Course Structure for Third & Fourth Semester for Scheme 2013

Course numbering Scheme:

М	E	1	0	5

- ME Code for the department offering the course CE,ME,EC,EE,CS,BS,HU
- 1 Level of the course 1,2,3,4 for UG 8&9 for PG
- **05** Specific code for the course

List of Courses for III & IV Semesters

S No	Course No	Course Title					
	C	ore Courses and Practicals					
1	ME201	Fluid Mechanics & Machinery					
2	ME202	Engineering Thermodynamics					
3	ME203	Basic Manufacturing Technology					
4	ME204	Material Science & Metallurgy					
5	ME205	Machine Drawing					
6	ME206	Metallurgy and Welding Lab					
7	ME207	Mechanics of Solids					
8	ME208	Production Economics & Financial Management					
9	ME209	Thermal Engineering					
10	ME210	Machine Tools and Modern Machining Processes					
11	ME211	Kinematics of Machines					
12	ME212	Machine Tools lab					
13	ME213	Computer Aided Drafting					
14	EE213	Electrical & Electronics Engineering Lab					
15	CE218	Mechanics of Solids and Fluids Lab					
Basic Scien	nce Core						
1	BS201	Numerical Methods & Complex variables					
Mandator	Mandatory Learning Courses						
1	1 ML201 Quantitative Aptitude						
2	2 ML203 Business English & Technical Writing						

Scheme of Instruction and Examination (Effective from 2013-14)

	III Semester (ME)						Scheme	e :2013		
s.	Subject	Code	Credits	Scheme of Instruction periods/week			Duration of end	Scheme of Examination Max Marks		
No				L D/T P		Р	(Hours)	End Exam	Internal Assessment	Total
Ι	Theory									
1	Numerical Methods & Complex variables	BS201	3	3	1	-	3	70	30	100
2	Fluid Mechanics & Machinery	ME201	3	3	1	-	3	70	30	100
3	Engineering Thermodynamics	ME202	3	3	1	-	3	70	30	100
4	Basic Manufacturing Technology	ME203	3	3	-	-	3	70	30	100
5	Material Science & Metallurgy	ME204	3	3	-	-	3	70	30	100
6	Machine Drawing	ME205	3	1	3	-	3	70	30	100
7	Quantitative Aptitude	ML201	2	1	1	-	-	-	100	100 100
Π	Practical									
8	Electrical & Electronics Engineering Lab	EE213	2	-	-	2	3	70	30	100
9	Metallurgy and Welding Lab	ME206	2	-	-	2	3	70	30	100
	Total		24	17	7	4		560	340	900

BS 201: NUMERICAL METHODS & COMPLEX VARIABLES (NMC)

(For ME -III Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

L	T/D	Ρ	С
3	1	-	3

Course Outcomes:

At the end of the course students will be able to

- 1. Apply Complex techniques in engineering, science and also in branches of applied mathematics.
- 2. Apply numerical solutions in engineering, science includes fluid dynamics, boundary layer theory and heat transfer quantum mechanics.
- 3. Apply probability and statistics in fields of physical sciences and engineering

Unit - I

Complex Variables & Integration: Analytic function, Cauchy-Riemann equations, sufficient condition for analyticity, Harmonic function. Method to find the Conjugate function, Milne – Thomson method. Simple and Multiple Connected regions, Cauchy's Integral theorem, Cauchy's integral formula, Generalized Integral formula.

Unit – II

Complex Series & Contour Integration: Taylor's series, Maclaurin's series and Laurent's series. Residue theorem, Method of finding residues. Evaluation of real integrals by contour integration, Integration round the unit circle and in the interval $(-\infty, \infty)$.

Unit-III

Differential equations & Special functions: Cauchy's homogeneous linear equation, Legendre's linear equation. Gamma function, value of $\Gamma(1/2)$. Beta function. Relation between Beta and Gamma functions.

Unit – IV

Interpolation : Operators, relation between the operators. Newton's forward and backward interpolation formulae. Gauss forward and backward interpolation formulae. Numerical differentiation.

Unit – V

Numerical Methods: Solution of first order Differential equations. Taylor's method, Picard's method, Euler's and modified Euler's methods. Runge-Kutta methods of second and forth order. Milne's predictor - corrector method.

Unit – VI

Probability & Statistics: Baye's theorem. Random variables, discrete and continuous random variables. Mean and variance of a random variable. Normal distribution, properties. Correlation coefficient, Lines of regression

Text Books:

1. B.S. Grewal [2007], Higher Engineering Mathematics, Khanna Publishers, New Delhi. 2. T.K.V Iyengar and others [2013], Engineering Mathematics Vol-3, S.Chand & Co. New Delhi

Reference Books:

- 1. S.C.Gupta& V.K.Kapoor [1987], Elements of Mathematical Statistics, S.Chand Publishers, New Delhi.
- 2. N.P.Bali and others [2009], A Text book of Engineering Mathematics, Laxmi Publishers, New Delhi.

Note:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

ME201: FLUID MECHANICS & MACHINERY (FMM) (For ME -III Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

L	T/D	Ρ	С
3	1	-	3

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the properties of fluids and manometry
- 2. Determine the center of pressure on plane and curved surfaces using hydrostatic principles
- 3. Solve fluid flow problems in closed pipes using Bernoulli equation.
- 4. Determine hydrodynamic forces of jets on surfaces
- 5. Analyze characteristics of Pelton wheel, Francis turbine and Kaplan Turbine
- 6. Analyze characteristics of centrifugal pumps and reciprocating pumps.

Unit – I

Fluid Properties: Definition of a Fluid, Density, Sp. Weight, Sp. Gravity, Sp. Volume, Ideal Fluid, Real Fluid, Vapour Pressure, Compressibility, Surface Tension, Capillarity, Viscosity. Classification of fluids, velocity gradient, Newtonian and non Newtonian fluids.

Fluid Statics: Pressure Head, Absolute, Gauge and Atmospheric Pressure – Pressure Measurement and Manometers – Hydro-static Forces on Vertical, Inclined Planes and Curved Surfaces. **Unit – II**

Fluid Kinematics: Types of Fluid Flow – Continuity Equation – Continuity Equation In Differential form for Three-Dimensional Flow – Velocity – Acceleration – Velocity Potential and Stream Function.

Fluid Dynamics: Euler's Equation of Motion – Bernoulli's Equation From Euler's Equation – Practical Applications of Bernoulli's Equation – Venturi Meter - Orifice Meter.

Unit – III

Momentum equation: Impulse Momentum Equation and its Applications.

Flow Measurement: Velocity Measurements: Pitot Tube – Pitot Static Tube.

Flow Through Pipes: Regimes of Flow, Reynolds Number – Hagen Poiseuille Equation – Darcy Weisbach Equation – Friction Factor – Minor Energy Losses – Energy Gradient and Hydraulic Gradient Line.

Unit – IV

Impact of Jets: Hydrodynamic Force of Jets on Stationary – Vertical and Inclined Flat Plates, Curved Vanes. Moving – Vertical and Inclined Flat Plates, Curved Vanes.

Unit – V

Hydraulic Turbines: General Layout of Hydroelectric Power Plant – Definition of Heads and Efficiencies of a Turbine – Classification of Hydraulic Turbines – Pelton Wheel – Francis Turbine – Kaplan Turbine.

Unit - VI

Centrifugal pumps: Components – Work Done – Definitions of Heads and Efficiencies – Priming – Cavitation – Performance Characteristics

Reciprocating Pumps: Classification of Reciprocating pumps – Main components and working principle – Discharge, Work done and Power required to drive reciprocating pump – Coefficient of discharge and slip.

Text Books:

- 1. P.N. Modi and S.M. Seth [2010], Hydraulics and Fluid Mechanics, Standard Book House, New Delhi.
- 2. R.K. Bansal [2012], *Fluid Mechanics And Hydraulic Machines*, Laxmi Publications (P) Ltd., New Delhi.
- 3. Victor L. Streeter, E. Benjamin Wylie [2011], *Fluid Mechanics*, McGraw Hill Publication, New York.

Reference Books :

- 1. J.A.Roberson and C.T.Crowe [1999], Engineering Fluid Mechanics, Jaico Publication, New Delhi.
- 2. S.W.Yuan [1988], Foundation of Fluid Mechanics, PHI Publishers, New Delhi.
- 3. S.C. Gupta [2007], Fluid Mechanics and Hydraulic Machines, Pearson Publications, New Delhi.

Note:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

ME202:ENGINEERING THERMODYNAMICS (ETD) (For ME -III Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

L	T/D	Ρ	С
3	1	-	3

Course Outcomes:

At the end of the course students will be able to

- 1. Solve problems on work and heat transfer using thermodynamic priniciples.
- 2. Understand zeroth ,first and second law of thermodynamics.
- 3. Solve problems using first and second law of thermodynamics and their applications on open and closed system
- 4. Analyze entropy principle, available energy and their applications.
- 5. Understand properties of pure substances ,gas mixtures and thermodynamic relations

UNIT – I

BASIC CONCEPTS AND DEFINITIONS : Thermodynamic System, State, Properties, Processes and Cycle, Thermodynamic Equilibrium, Quasi-static Process, Zeroth Law of Thermodynamics.

WORK AND HEAT TRANSFER: Work Transfer, Path and Point Functions, Displacement Work in Various Processes, Shaft Work, Flow Work, Free Expansion, Heat Transfer, Specific and Latent Heat, Comparison of Work and Heat Transfer.

UNIT – II

FIRST LAW OF THERMODYNAMICS: First Law for a Closed System Undergoing a Cycle and a Process, Energy, Different Forms of Stored Energy, Specific Heat at Constant Volume and Constant Pressure, Enthalpy, PMM1.

FIRST LAW APPLIED TO FLOW SYSTEMS: Control Volume, Steady Flow Process, Mass and Energy Balance, Applications of Steady Flow Processes, Problems.

UNIT – III

SECOND LAW OF THERMODYNAMICS : Heat Engine, Kelvin-Plank Statement, Clausius Statement, Refrigerator and Heat Pump, Equivalence of Kelvin-Plank and Clausius Statements, Reversibility and Irreversibility, Carnot Cycle, Carnot's Theorem, Corollary of Carnot's Theorem, Thermodynamic Temperature Scale, Efficiency of A Reversible Heat Engine, PMM2.

UNIT IV

ENTROPY: Clausius' Theorem, Property Of Entropy, T-S Plot, Clausius Inequality, Principle of Entropy Increase, Applications of Entropy Principle.

UNIT – V

AVAILABILITY: Available Energy, Maximum Work in A Reversible Process, Availability in Non - Flow and Flow Processes, Gibbs and Helmholtz Functions.

THERMODYNAMIC RELATIONS: Some Mathematical Theorems, Maxwell's Equation, Tds Equations, Joule-Kelvin Effect, Clausius-Clapeyron Equation. **UNIT – VI**

PROPERTIES OF PURE SUBSTANCES: P-V, P-T and T-S Diagrams for a Pure Substances, Mollier

Diagram, Quality and Dryness Fraction, Steam Tables

PROPERTIES OF GASES AND GAS MIXTURES: Avogadro's Law, Equation of State of a Gas, Ideal Gas, Specific Heats, Internal Energy, Enthalpy of an Ideal Gas, Entropy Change of an Ideal Gas, Law of Reversible Adiabatic Expansion for an Ideal Gas, Van Der Waals Equation, Mixtures of Gases – Dalton's Law of Partial Pressures, Specific Heats, Internal Energy and Enthalpy of Gas Mixtures

TEXT BOOKS:

- 1. P.K. Nag [2007], Engineering Thermodynamics, TMH Publishers, New Delhi..
- 2. R.K.Rajput [2008], Thermal Engineering, Lakshmi Publications, New Delhi.

REFERENCE BOOKS:

1. Joel Rayner [1996], Basic Engineering Thermodynamics, Addison- Wesley Publication, Masachusettes.

2. E. RadhaKrishna [2009], *Fundamentals of Engineering Thermo dynamics*, PHI Publishers, New Delhi.

3. G.J.Van Wylen, Sonntag [2007], *Fundamentals of Thermodynamics*, John Wiley & Sons Publishers, Singapore.

4. S.C.Gupta [2005], Engineering Thermodynamics, Pearson Education, New Delhi

5. B.Sreenivasa Reddy & K.Hemachandra Reddy [2007], *Thermal Data Handbook*, *IK International Publishers*, *Bangalore*

Note:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

ME203: BASIC MANUFACTURING TECHNOLOGY (BMFT)

(For ME -III Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 HrsImage: Image of the system of t

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the casting processes, construction and operation of melting furnaces and design of gating system.
- 2. Understand the metal working and metal forming processes including rolling, forging, extrusion, drawing and their load estimations.
- 3. Understand the processing of plastics with their applications.
- 4. Understand the welding techniques including gas welding, arc welding, resistance welding, thermit welding, laser beam welding, electron beam welding and their applications.

Unit-I

Casting Process : Casting, casting terms, pattern materials, types of patterns, pattern allowances, colour code for patterns, Moulding sands, core sands, properties of moulding sand and its ingredients, different types of moulding machines, use of chaplets, chills, riser and gating system. Design of patterns, moulds and cores. Riser and gating design.

Unit-II

Special Casting Processes : CO_2 moulding, die casting, centrifugal casting, shell moulding, investment or lost wax process; Casting defects causes and remedies. Furnaces used in foundry – cupola, pit furnace, electric arc furnaces.

Unit-III

Forming Processes : Stress – Strain in elastic and plastic deformation, hot working, cold working process and relative advantages and disadvantages.

Rolling: Principle of rolling, types of rolling mill, Two high, three high and cluster mill, Planetary mill and Sendzmir mill. Load estimation in Rolling.

UNIT-IV

Forging: Principle of forging, forging operations, forging types – smith forging, drop forging, press forging, machine forging. Load estimation in Forging.

Extrusion and drawing Processes : Principle of extrusion, forward and back ward, cold extrusion forging, tube extrusion, hydro static extrusion and impact extrusion. Principle of drawing, wire drawing and tube drawing.

Unit-V

Processing of Plastics : Classification of plastics, thermoplastics, thermosetting plastics and applications, injection, compression and blow moulding, extrusion, calendaring and thermoforming. Welding of plastic materials

Unit-VI

Gas Welding: Gas welding equipment, Oxyacetylene welding, types of flames, techniques of welding and oxy- acetylene cutting.

Arc Welding: Arc welding equipment, Metal arc welding – functions of electrode coating, TIG, MIG and Submerged arc welding process (SAW),

Resistance welding: Principles of resistance welding, spot, projection, seam, butt, upset and flash welding process. . Soldering, brazing and braze welding.

Principle and Applications of Thermit welding, Laser beam welding, Electron beam welding

Text Book :

1. P. N. Rao [2012], *Manufacturing Technology: Foundry, Forming and Welding*, TMH Publishers, New Delhi.

2. P. C.Sharma [2009], *A Text of production Technilogy*, S Chand and Company, New Delhi **Reference Books:**

- 1. R. K. Jain [2005], Production Technology, KhannaPublication, New Delhi.
- 2 Kalpak Jian, Schmid [2009], Manufacturing processes for Engineering Materials. Pearson, New Delhi
- 3. Roy A. Lindberg [2008], Processes and Materials of Manufacture, PHI Publishers, New Delhi.

Note:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

ME204: MATERIAL SCIENCE & METALLURGY (MSM) (For ME -III Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Understand concepts of crystal structures, characteristics of crystal structures, Miller Indices for Directions, Planes.and crystal imperfections of Materials
- 2. Understand the Elastic and Plastic deformation processes of metals and concept of pure metals, alloys and solid solutions.
- 3. Select Alloys for Engineering Applications using Phase Diagrams
- 4. Identify Heat treatment processes to improve Mechanical properties of materials for applications in Engineering Industries.
- 5. Identify Ferrous and Non-Ferrous metals and their applications in view of Environment and Safety.
- 6. Understand the methods of metal Powder Production and Powder Metallurgy Processes and their Applications.

Unit – I

Introduction: Introduction to Materials Science and metallurgy, classification of Materials. Crystal Structures Unit cell, Space lattice, different crystal structures, Bravies lattices, co ordination number, effective number of atoms, atomic packing factor, Miller indices for Crystallographic directions and planes for cubic systems, Crystal Imperfections – Point imperfections(point defect), line imperfections and Dislocations, dislocation types and surface imperfections.

Unit - II

Deformation Processes : Classification, Types of deformations, Elastic and plastic deformations, Mechanisms of plastic deformations-Slip and Twinning, Hot working and cold working, recovery, recrystalisation and grain growth, Creep, Stages of creep, Factors influencing creep.

Pure metal, alloy and Solid solutions: Notion of pure metal and alloy, types of solid solutions Substitutional and Interstitial solid solutions. Humerothery's rules.

Unit - III

Phase Diagrams: Introduction Interpretation of Binary equilibrium Diagrams. Lever Rule ,Phase rule. Binary Isomorphous, Binary Eutectic , Eutectoid , Peritectic ,Peritectiod Binary systems. Simple problems on Equilibrium Diagrams.

Iron Carbon Equilibrium Diagram: Cooling curve of pure iron, construction and interpretation of Fe-Fe₃C diagram, Effect of alloying elements on Fe-Fe₃C diagram.

Unit – IV

Heat Treatment of Steels: Pupose of heat treatment, different heat treatment processes, Annealing, Normalising, Hardening, and Tempering, TTT diagrams, Hardenability, factors affecting hardenability, determination of hardenability.

L	T/D	Ρ	С
3	-	-	3

Unit – V

Alloy Steels and Cast Irons: Purpose of alloying, classification of steels- Stainless steels, Heat resistance steels, High speed steels. Properties and uses of various types of Cast irons VIZ White cast iron, Grey cast iron, malleable cast iron & S.G. cast iron and their applications.

Non Ferrous Metals and Alloys: Properties and uses of important non ferrous metals and alloys like Copper, Nickel, Aluminum, Lead and Tin.

Unit – VI

Powder Metallurgy: Introduction, advantages of Powder Metallurgy, Preparation of metal powders-Mixing, Blending, Compacting, Sintering & Hot-pressing applications of powder metallurgy, examples of typical components produced.

Text Books :

- 1. William D Callister [2014] Material science and Engineering a dopted by R.Bala Subramaniam. Wiley India Pvt Ltd New Delhi
- 2. V. Raghavan [2008], Material Science and Engineering, PHI Publishers, New Delhi.
- 3. Sidney H. Avner[2008], Introduction to Physical Metallurgy. TMH Publications, New Delhi

Reference Books :

1. William F. Smith [2000], Fondations of *Material Science and Engineering*, McGraw Hill, New York.

2. Kenneth G. Budinski [2010], *Engineering Materials Properties and Selection*, PHI Publishers, New Delhi.

3. Dr. V.D. Kodgire, S.V. Kodgire [2008], *Material Science and Metallurgy*, Everest Publications, New Delhi.

Note:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

ME205: MACHINE DRAWING (MD)

(For ME -III Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

L	T/D	Ρ	С
1	3	-	3

Course Outcomes:

At the end of the course students will be able to

- 1. Draw sectional views of thread profiles (V-sharp, whit-worth, Buttress, square, ACME, worm), Bolts & Nuts, keys cotters & pin joints, solid and bushed journal bearings.
- 2. Draw riveted joints & shaft couplings.
- 3. Draw assembly of Engine parts, Machine tool parts & accessories, Miscellaneous parts (screw jack, swivel bearing, pipe vice).

Unit - I

Screwed Fastenings : Various thread profiles, Multi start threads, Right and left hand threads, Square and hexagonal bolts and nuts, Assembly of bolt, nut and washer. Eye bolts, Cap screws and machine screws. Lock- ing arrangements for nuts, Foundation bolts.

Keys, Cotters and Pin Joints : Different types of keys in assembly, cotter joint with sleeve, cotter joint with socket and spigot ends, cotter joint with gib, knuckle joint.

Bearings : Solid and bushed journal bearing, Pedestal bearing, Footstep bearing.

Unit – II

Riveted Joints: Different types of riveted heads, Single riveted lap joint, double riveted chain and zig zag lap and butt joints.

Shaft Couplings : Muff couplings, Flanged coupling, Compression coupling, Claw coupling, Universal coupling and Oldham coupling.

Unit – III

Assembly Drawing : Assembly drawings of the following:

Engine Parts : Stuffing box, Steam engine Cross head and eccentric. **Machine Tool Parts and Accessories:** Square tool post, Lathe Tail Stock and shaper tool post.

Miscellaneous Parts: Screw Jack, Swivel bearing and pipe vice.

Part Drawing: Petrol engine Connecting rod, Drill jig and Revolving center.

Introduction to Geometric Modelling (Not for End Examination): Types of modelling, introduction to Modelling Packages CATIA, CRE-o.

Text Books :

- 1. K.L. Narayana, K. Venkata Reddy [2008], *Machine Drawing*, NAI Publication, New Delhi.
- 2. P.S. Gill [2008], Machine Drawing, Kataria Publication, New Delhi

Reference Books :

1. N.Sidheswar, P. Kannaiah [2008], Machine Drawing, TMH Publishers, New Delhi

- 2. K.R. Gopalakrishna [1995], Machine Drawing, Subhash Publication, New Delhi.
- 3. K.L. Narayana, K. Venkata Reddy [2007], Production Drawing, NAI Publication, New Delhi.

4. N.D. Junnarkar [2009], Machine Drawing, Pearson Publication, New Delhi.

Note: The question paper shall consist of **THREE** units with **TWO** questions (each 15 Marks) in first two units and **ONE** question (40 Marks) in unit-3. The student shall answer **ONE** question in each unit.

ML201: QUANTITATIVE APTITUDE (QA) (Common for all branches of -III Semester)

Scheme : 2013 Internal Assessment : 100

Course Outcomes:

At the end of the course students will be able to

- 1. Cracks Career Aptitude Tests with ease and identifies his/her innate component of competency.
- 2. Tends to be quick learner, highly adaptive and productive.
- 3. Exhibits better problem solving skills with best approaches.
- 4. Tends to be creative in solving problems with 'out of the box' thinking.
- 5. Compares, differentiates and establishes relations with rational and logical thinking.
- 6. Displays improved mental ability and swiftness

Numerical Ability

Number Systems, HCF and LCM, Decimal Fractions, Square Roots and Cube Roots, Linear and Quadratic Equations

Averages, Mixtures & Allegations, Ages, Ratios, Proportions and Variations, Percentages, Profit and Loss

Time, Speed and Distance, Time and Work

Permutations and Combinations, Probability, Clocks and Calendars

Introduction to concepts of Reasoning

Cubes, Series and sequences, Odd man out, Coding and decoding

General Mental Ability

Puzzles and Teasers

References Books:

- 1. Arun Sharma, How to Prepare for Quantitative Aptitude, TMH Publishers, New Delhi.
- 2. R.S. Aggarwal, Quantitative Aptitude, S.Chand Publishers, New Delhi.
- 3. Sharon Weiner-Green, Ira K. Wolf, Barron's GRE, Galgotia Publications, New Delhi.
- 4. Ethnus, Aptimithra, McGraw Hill Publishers
- 4. R.S Aggarwal, Verbal and Non-Verbal Reasoning, S.Chand Publishers, New Delhi.
- 5. Shakuntala Devi, Puzzles to Puzzle You, Orient Paper Backs Publishers, New Delhi.
- 6. Shakuntala Devi , More Puzzles, Orient Paper Backs Publishers, New Delhi.
- 7. Ravi Narula , Brain Teasers, Jaico Publishing House, New Delhi.
- 8. George J Summers, Puzzles and Teasers, Jaico Publishing House, Mumbai.

L	T/D	Ρ	С
1	1	-	2

DISTRIBUTION AND WEIGHTAGE OF MARKS

There shall be four objective type (Paper / PC based) tests, carrying 25 marks each, during the semester. The sum of the marks scored in all these four tests shall be the final score.

EE213 :ELECTRICAL & ELECTRONICS ENGINEERING LAB (EEE(P)) (For ME -III Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the working principles of generator, motor, transformer and alternator.
- 2. Analyze the performance of DC and AC electric machines by conducting suitable tests.

LIST OF EXPERIMENTS

- 1. Swineburne's test
- 2. Brake test on D.C. Shunt Motor
- 3. OCC of D.C. Shunt Generator
- 4. O.C and S.C tests on single phase transformer
- 5. Brake test on 3 phase squirrel cage induction motor
- 6. Determination of voltage regulation of 3 phase alternator by synchronous impedance method
- 7. Study of CRO
- 8. Logic Gates and half adder
- 9. PN Diode and Zener characteristics
- 10. Half Wave and full wave Rectifiers
- 11. CE Configuration
- 12. CE Amplifier

L	T/D	Ρ	С
-	-	2	2

ME206: METALLURGY AND WELDING LAB (MTW(P)) (For ME -III Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Prepare the specimen and recognize the micro structures of metals and alloys using metallurgical microscope.
- 2. Conduct the jomeny -end quench test for determination of hardenability of metal.
- 3. Measure GFN, permeability, clay content, moisture content, shear and compressive strength of the moulding sand
- 4. Prepare welded joints using Metal Arc, MIG and TIG welding process.

LIST OF EXPERIMENTS

- 1. Specimen preparation
- 2. Study of Metallurgical microscope and study of some structures of ferrous and non ferrous specimens
- 3. Experiment to find GFN on Sieve Shaker
- 4. Experiment to find percentage of clay and percentage of moisture in the moulding sand
- 5. Permeability test on moulding sand
- 6. Shear test & Compression test on sand mould
- 7. Determing hardness of material after various heat treatment processes
- 8. Determining hardenability using Jomeny end Quench Apparatus.
- 9. Experiment on Arc welding, Arc cutting and Fire cracker welding
- 10. MIG welding and Testing of weld cracks by die penetrant test
- 11. Joining of thin sheet metals by Spot welding
- 13. Joining thin metal plates by Gas Welding
- 14 Making of pet bottle and cap using Blow moulding and Injection Moulding

L	T/D	Ρ	C
-	-	2	2

FOUR YEAR B.Tech DEGREE COURSE

Scheme of instruction and Examination

(Effective from 2013-14)

	IV Semester (ME) Scheme:2013									
s.	Subject	Code	Credits	Scheme Instruction periods/week		of	Duration of	Scheme of Examination		
No				L	D/T	Р	end Exam	Enu	Assessment	Total
Ι	Theory									
1	Mechanics of Solids	ME207	3	3	1	-	3	70	30	100
2	Production Economics & Financial Management	ME208	3	3	-	-	3	70	30	100
3	Thermal Engineering	ME209	3	3	1	-	3	70	30	100
4	Machine Tools and Modern Machining Processes	ME210	3	3	-	-	3	70	30	100
5	Kinematics of Machines	ME211	3	3	1	-	3	70	30	100
6	Business English & Technical Writing	ML203	2	1	2	-	-	-	100	100
II	Practical									
7	Mechanics of Solids and Fluids Lab	CE218	2	-	-	2	3	70	30	100
8	Machine Tools lab	ME212	2	-	-	2	3	70	30	100
9	Computer Aided Drafting	ME213	2	-	-	2	3	70	30	100
	Total		23	16	5	6	-	560	340	900

ME207: MECHANICS OF SOLIDS (MS) (For ME -IV Semester)

Scheme	: 2013
Internal Assessment	: 30
End Exam	:70
End Exam Duration	: 3 Hrs

L	T/D	Ρ	C
3	1	-	3

Course Outcomes:

At the end of the course students will be able to

- 1. Construct shear force and bending moment diagrams for simple supported beam, cantilever beam and overhanging beam under point load, uniformly distributed and uniformly varying load.
- 2. Calculate the bending stress and shear stresses in a beam.
- 3. Compute the shear stress and twist of a shaft under torsional loading and principal stresses under combined loading using analytical and graphical (Mohr's circle) method.
- 4. Calculate deflection for simple supported beam, cantilever beam and overhanging beam under point load, Uniformly distributed and uniformly varying loads using macaulay's method and double integration method.
- 5. Determine stresses in thin cylinders, thick cylinders and compound cylinders.
- 6. Determine the buckling load for a column, core of rectangular and circular section, stress distribution due to combined bending and axial loads.

Unit - I

Bending Moment and Shear Force : Types of determinate beams, loads, bending moment and shear force and their relation with load. Cantilever and simply supported beams with and without overhangs for all types of loads, shear force and bending moment diagram.

Unit - II

Bending and Shear Stresses : Theory of simple bending, distribution of flexural stresses and shear stresses.

Unit – III

Torsion : Theory of pure torsion in solid and hollow circular shafts, transmission of power. Analysis of members subjected to combined torsion and bending.

Principal Stresses: Principal planes and Principal stresses, Mohr's circle of stress.

Unit - IV

Deflection : Relationship between curvature, slope and deflection. Slope and deflection of cantilever and simply supported beams by successive integration method & Macaulay's method.

Unit - V

Cylindrical Pressure Vessels : Thin cylinders subjected to internal fluid pressure, thick cylinders under internal and external pressures, compound thick cylinders, shrink fit.

Unit - VI

Columns : Slenderness ratio, Axially loaded columns, Euler's theory, Various end conditions, Rankine's theory.

Combined Direct and Bending Stresses : Core of section- circular and rectangular sections (solid and hollow), stress distribution due to combined bending and axial loads.

Text Book :

- 1. B.C. Punmia, Ashok.K. Jain and Arun .K.Jain [2009], *Mechanics of Materials*, Lakshmi Publishers, New Delhi.
- 2. S. S. Rattan [2011], Strength of materials, Tata Mc Graw Hill Publishing Company Ltd., New Delhi
- 3. S S Bhavikatti [2010], *Strength of materials*, Third Edition, Vikas Publishing House Pvt. Ltd., New Delhi
- 4. R Subramanian [2010], Strength of Materials, Oxford University press, New Delhi

Reference Books:

- 1. Sadhu Singh [1999], *Strength of Materials*, Khanna Publishers, New Delhi.
- 2. Timoshenko and Young [1968], *Elements of Strength of Materials*, CBS Publications, New Delhi.
- 3. P.N. Singh and P.K. Jha [1987], *Elementary Mechanics of Solids*, Wiley Easten Publication, New Delhi.

Note:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

ME208: PRODUCTION ECONOMICS & FINANCIAL MANAGEMENT (PEFM) (For ME -IV Semester)

Scheme	: 2013					
Internal Assessment	: 30	Γ	L	T/D	Ρ	С
End Exam	: 70			•		
End Exam Duration	: 3 Hrs		3	-	-	3

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the Economic Theories and their application for Managerial Decisions.
- 2. Understand elements of costs and depreciation used in industry practices to manufacture the product.
- 3. Understand the tools of financial analysis and management.
- 4. Apply financial management skills for making financial decisions in practical business situations

Unit - I

Introduction to Economics : Definition, Demand analysis, Types of demand, Factors determining demand, law of demand-Assumptions & exceptions, law of diminishing marginal utility, Elasticity of demand, Factors governing elasticity of demand.

Unit - II

Elements of Cost: Elements of cost - Material cost, Labourcost, Overheads (Factory overheads, Administrative overheads, Selling and distribution overheads), Methods of allocation of overheads

Depreciation: Definition, Causes of depreciation, Methods of calculating depreciation -Straight line method of depreciation, Diminishing balance method of depreciation, Sinking fund method of depreciation, Annuity charging method.

Unit - III

Accountancy: Introduction, Double entry Book keeping, Journal, Ledger, Trail balance.

Unit – IV

Accountancy - Final Accounts: Preparation of Trading, Profit & loss account, Balance sheet with simple adjustments pertaining to closing stock, depreciation, income & expenses.

Unit -V

Financial Management : Objectives, functions, time value of money, Present value of - single cash flow, multiple cash flows and Annuity, Future value of - single cash flow, multiple cash flows and Annuity.

Financial Statement Analysis: Ratio analysis, Liquidity ratios (current ratio, & quick ratio), Activity ratio's (Inventory turnover ratio, Debtors turnover ratio), Capital structure ratio's (Dept-Equity ratio, Interest coverage ratio) & Profitability ratios (Gross profit ratio, Net profit ratio, Operating ratio, P/E ratio & EPS)

Unit - VI

Capital budgeting : Capital budgeting & its significance, capital budgeting evaluation techniques- Pay back period method, Accounting rate of return (ARR) method, Net present value (NPV) method, Profitability index method, Internal Rate of Return (IRR) method-(Simple problems).

Text Books :

- 1. K.K.Dewatt [2009], Modern EconomicTheory, Shyamlal Charitable Trust, New Delhi.
- 2. Prasanna Chandra [1999], Fundamentals of Financial Management, TMH Publishers, New Delhi.
- 3. S.P. Jain and K.L.Narang [2009], *Financial Accounting*, Kalyani Publications, Ludhiana.
- 4. Banga and Sharma [2011], Mechanical Estimation and Costing, Khanna Publishers, New Delhi.

Reference Book :

1. M.Y Khan and P.K Jain [2009], Financial Management, TMH Publishers, New Delhi.

Note:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

ME209: THERMAL ENGINEERING (TE) (For ME -IV Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Determine efficiency, work done and mean effective pressure of gas & steam power cycles
- 2. Understand working of fire, water tube boilers and their mountings & accessories
- 3. Determine performance of steam generators and boiler draught
- 4. Solve the problems on flow through nozzles and condensers
- 5. Solve the problems on impulse and reaction turbines using velocity triangles
- 6. Understand the working of nuclear reactor and diesel power plant

UNIT-I

GAS POWER CYCLES : Carnot Cycle, Stirling Cycle, Ericsson Cycle, Air Standard Cycles- Otto Cycle, Diesel Cycle, Dual Cycle, Comparison of Otto, Diesel and Dual Cycles, Second Law Analysis of Gas Power Cycles

STEAM POWER CYCLES: Simple Steam Power Cycle, Rankine Cycle, Comparison of Rankine and Carnot Cycles, Modified Rankine Cycle, Methods of Increasing the Efficiency of Rankine Cycle, Reheating and Regenerative Cycles.

UNIT – II

STEAM GENERATORS: Introduction, Classification of Boilers, Fire Tube Boilers, Water Tube Boilers, Merits And Demerits of Fire Tube Boilers, High Pressure Boilers, Advantages of High Pressure Boilers, Boiler Mountings and Accessories

UNIT III

PERFORMANCE OF STEAM GENERATORS AND BOILER DRAUGHT : Equivalent Evaporation Capacity, Efficiency of Boiler, Types of Draught, Calculation of Chimney Height and Diameter, Condition for Maximum Discharge through a Chimney, Chimney Efficiency

UNIT -IV

STEAM NOZZLES : Isentropic Flow through Nozzles, Velocity of Steam Leaving through Nozzle , Discharge of Steam through Nozzle , Condition for Maximum Discharge through Nozzle - Critical Pressure Ratio, Effect of Friction , Nozzle Efficiency.

STEAM CONDENSERS: Function of Condensers, Classification of Condensers, Jet Condensers, Surface Condensers, Comparison of Jet and Surface Condensers, Mass of Circulating Water Required in a Condenser, Condenser Efficiency and Vacuum Efficiency

UNIT- V

IMPULSE STEAM TURBINES : Classification, Principle of operation of impulse turbine, , De-Laval Turbine - its features, compounding of impulse turbine, velocity diagram for single stage impulse turbines, effect of friction, power developed, axial trust, diagram efficiency, condition for maximum efficiency, Governing of steam turbines

REACTION TURBINES: Principle of Operation, Velocity Diagram, Degree of Reaction, Parson's Reaction Turbine, Power Produced by Reaction Turbine, Height of Blades of Reaction Turbine, Comparing Reaction

L	T/D	Ρ	C
3	1	-	3

and Impulse Turbines

UNIT VI

NUCLEAR POWER PLANT AND DIESEL POWER PLANT: Nuclear Fission, Nuclear Fusion, Chain Reaction, Components of Nuclear Power Plant, Types of Nuclear Reactors, Introduction of Diesel Power Plant, Essential Components of Diesel Power Plant, Layout of Diesel Power Plant

TEXT BOOKS:

- 1. R.K.Rajput [2008], Thermal Engineering, Lakshmi Publications, New Delhi.
- 2. R.C.Arora [2012], Refrigeration and Air Conditioning, TMH Publishers, New Delhi.
- 3. P.K Nag[2008], Power Plant Engineering, Lakshmi Publications, Bangalore

REFERENCE BOOKS:

- 1. P.L. Ballaney [2007], Thermal Engineering, Khanna Publishers, New Delhi.
- 2. V.P. Vasandhani and D.S. Kumar [2003], *Heat Engineering*, Metropolitan Books, New Delhi.
- 3. S.C.Arora and S.Domakundwar [2006], *Refrigeration and Airconditioning*, Dhanpat Rai and Sons Publications, New Delhi.
- 4. S.C. Gupta [2005], Thermal Engineering, Pearson Education, New Delhi.
- 5. R.J. Dossat [2008], Principles of Refrigeration, Pearson Education, New Delhi.

6. B.Sreenivasa Reddy & K.Hemachandra Reddy [2007], Thermal data hand book, IK International Publishers, Bangalore

7. G.D.Rai(2006), Power Plant Engineering, Khanna Publishers, New Delhi

Note:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

ME210:MACHINE TOOLS AND MODERN MACHINING PROCESSES (MTMP) (For ME -IV Semester)

Scheme	: 2013
Internal Assessment	: 30
End Exam	: 70
End Exam Duration	: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the construction and operations performed on Lathe machines.
- 2. Understand the construction and operations performed on Drilling and Boring machines.
- 3. Understand the construction and operations performed on machine tools including Shaper, Planner and Slotter machine.
- 4. Understand the construction and operations performed on Milling machine and solve the problems on indexing.
- 5. Understandthe construction and operations performed on Grinding, Honing, Lapping and Super Finishing machines.
- Understand the working of modern machining process including Electrical Discharge Machining (EDM), Electro Chemical Machining (ECM), Laser Beam Machining (LBM), Electron Beam Machining (EBM), Plasma Arc Machining (PAM), Ultrasonic Machining (USM) and Abrasive Jet Machining (AJM).

Unit-I

Lathe : Introduction, types of lathes, size of lathe, parts of a lathe, Lathe accessories and Lathe attachments, lathe operations

Capstan and Turret Lathes: Introduction, Difference between capstan and turret lathes principal parts of capstan and turret lathes, capstan and turret mechanism (turret indexing mechanism and bar feeding mechanism)

Unit-II

Drilling : Introduction, Types of Drilling machines, upright drilling machine parts, radial drilling machine parts, drilling machine operations.

Boring: Introduction, Types of Boring machines, Principal parts of Horizontal boring machine, vertical boring machine and Jig boring machine

Unit-III

Shaper, Planner, Slotter : Introduction, Types of shapers, principal parts of a shaper, shaper size, shaper mechanisms, Crank and slotted link mechanism, Whit worth quick return mechanism, Hydraulic shaper mechanism, Shaper Operations. Introduction to planner, types of planning machines, parts of a planning machine, table drive mechanism, open and cross belt drive. Planer operations. Introduction to Slotter, Slotter size, parts of a Slotting machine. Slotter operations.

Unit-IV

Milling Machines : Introduction, Types of Milling machines, principal parts of a milling machine, milling machine operations (Plain milling, face milling, side milling, straddle milling, angular milling, gang milling, form milling, profile milling, end milling, milling keyways, grooves and slots and gear cutting). Dividing heads

- Plain or Simple dividing head, Universal dividing head. Indexing methods, Direct or Rapid indexing, Plain or simple indexing, Compound indexing, Differential indexing.

Unit-V

Grinding and surface finishing Machines : Introduction, Kinds of Grinding, Types of Grinding machines, Grinding wheel specifications, Glazing and loading in wheels, Dressing and trueing of grinding

L	T/D	Ρ	С
3	-	-	3

wheels. Honing, Honing machines, Lapping , Lapping machines and super finishing. Unit-VI

Unconventional Manufacturing Methods : Electrical Discharge Machining (EDM), Electro Chemical Machining (ECM), Laser Beam Machining (LBM), Electron Beam Machining (EBM), Plasma Arc Machining (PAM), Ultrasonic Machining (USM), and Abrasive Jet Machining (AJM).

Text Book :

- 1. S.K. Hajra Chowdhary & A.K. Haira Chowdhary [2004], *Work shop technology Volume II*, Media Promoters & Publishers, New Delhi.
- 2. P.C.Sharma [2006], Production Engineering, S. Chand Publishers, New Delhi.

Reference Books :

- 1. R.K.Jain [2008], *Production Technology*, Khanna Publishers, New Delhi.
- 2. P.N. Rao [2006], *Manufacturing Technology Metal cutting and Machine tools*, TMH Publishers, New Delhi.
- 3. Roy A. Lindberg [2006], Processes and Materials of Manufacture, PHI Publishers, New Delhi.
- 4. Kalpak Jian, Schmid [2009], Manufacturing processes for Engineering Materials. Pearson, New Delhi

Note:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

ME211: KINEMATICS OF MACHINES (KOM) (For ME -IV Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs



Course Outcomes:

At the end of the course students will be able to

- 1. Understand four bar mechanism, single slider crank mechanism, double slider crank mechanism and their inversions, principles of steering gear mechanisms and hookes joint.
- 2. Determine Velocity and acceleration of points in four bar mechanism, single slider crank mechanism and quick return motion mechanism by drawing velocity and acceleration diagrams.
- 3. Solve problems on gears and gear trains.
- 4. Solve problems on flat belt drive and V-belt drive.
- 5. Understand working of brakes, clutches and absorption and transmission dynamometers.

Unit- I

Definitions And Basic Concepts : Introduction, planar mechanisms, link or element, types of links, kinematic pair, types of kinematic pairs, kinematic chain, mechanism, machine, degrees of freedom or mobility, inversion of mechanism.

Mechanisms With Lower Pairs: Quadric cycle chain and its inversions, single and double slider crank chain and its inversions, applications, quick return motion mechanisms, Hooke's joint, double hook's joint. Davis and Ackermann steering gear mechanisms.

Unit – II

Velocity Analysis : Absolute and Relative Motions, motion of a link, velocity of rubbing, velocity diagrams for four bar mechanism, single slider mechanism and quick return motion mechanisms, Instantaneous Center, Kennedy's theorem, Instantaneous center four bar and single slider mechanisms.

Unit- III

Acceleration Analysis: Acceleration diagrams for four bar and single slider mechanism, Coriolis component of acceleration, acceleration diagrams for crank and slotted lever mechanism.

Unit – IV

Belt Friction : Types of belt drives, angular velocity ratio of flat belts, effect of belt thickness on velocity ratio, effect of slip on velocity ratio, length of flat belts, angle of contact of open and cross belts, Law of belting, ratio of belt tensions, power transmitted by belt drive, effect of centrifugal tension on the power transmitted, phenomenon of creep in belts, initial tension in belts and its effect on maxi mum power transmission, Power transmitted by V-belt drive.

Unit – V

Gears: Classification of Gears, gear terminology, law of gearing, velocity of sliding, path of contact, arc of contact, number of pairs of teeth in contact, forms of teeth. Interference in involute gears, minimum number of teeth, interference between rack and pinion.

Gear Trains: Simple gear train, compound gear train, reverted gear train, planetary or epicyclic gear train, velocity ratio of epicyclic gear train (tabular method), torques in epicyclic trains. Simple problems on gear trains.

Unit – VI

Clutches , Brakes and Dynamometers:, Cone clutch, single and multiple plate clutches. Simple block brake, band brake, Internal expanding shoe brake, Dynamometers- absorption and transmission types, general description and method of operation.

Text Books :

- 1. S. S. Rattan [2009], *Theory of Machines*, TMH Publishers, New Delhi.
- 2. Sadhu Singh [2012], Theory of Machines, Pearson Education, New Delhi.
- 3 C.S. Sharma and K.Purohit [2010], *Theory of Mechanisms and Machines*, PHI publishers, New Delhi

Reference Books :

- 1. Ballaney [2005], Theory of Machines, Khanna Publishers, New Delhi.
- 2. Thomas Bevan [2005], Theory of Machines, CBS Publishers, New Delhi.
- 3. J.S. Rao and R.V. Dukkipati [2008], Mechanisms and Machine Theory, NAI Publishers, New Delhi.
- 4. J.E. Shigley [2010], Theory of Machines and Mechanisms, McGraw Hill Publishers, New York.

Note:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

ML -203: Business English and Technical Writing(BETW) (Common to B.Tech IV Semester CE, EEE & ME Branches)

Scheme	: 2013
Internal Assessment	: 100

L	T/D	Ρ	С
2	1		2

The purpose of this course is to help the students enhance their proficiency in oral and written communication in English to enable them to use English effectively at the corporate workplaces with global presence.

Course Outcomes:

At the end of the course students will be able to

- 1. use grammatically acceptable English
- 2. demonstrate all aspects of language skills for a successful professional career
- 3. use English effectively in interpersonal and professional contexts
- 4. write and deliver technical content effectively
- 5. handle business correspondence effectively

Course Work

To achieve the objectives, the following course content is prescribed for the Business English and Technical Writing Laboratory Sessions.

Contents

- Revision of grammar and vocabulary:
 - articles, prepositions, tenses, concord
 - voices, reported speech, sentence types
 - synonyms, antonyms, one word substitutes, idioms, collocations
 - word making, affixes, commonly used foreign words, words often confused
 - jumbled sentences and jumbled paragraphs
 - common errors in English pertaining to both grammar and vocabulary (TOEFL type)
- Reading Comprehension practice tests
- Listening Comprehension practice tests
- Speaking skills with focus on correct pronunciation
- Writing Cover Letters for Job Applications/ Resume Preparation/ Statement of Purpose for Internships, Apprenticeships, Admissions in Universities, etc.
- Writing Technical Reports/ Proposals/Formats of Research Articles, Journal Papers, Project Reports
- Email writing
- Writing Business Letters/ Formats of Letters, Block Letters/Memos

References

- 1. Raj N Bakshi, "English Grammar Practice", Orient Longman.
- 2. Sangeeta Sharma & Binod Mishra, Communication Skills for Engineers and Scientists, PHI Learning Private Limited.
- 3. Marilyn Anderson, Pramod K.Naya and Madhucchanda Sen, Critical Reasoning, Acedemic Writing and Presentation Skills, Pearson Publishers.
- 4. M. Ashraf Rizvi, Effective Technical Communication, Tata McGraw-Hill Publishing Company Ltd., 2005.
- 5. Raymond V. Lesikar, Marie E. Flatley, "Basic Business Communication: Skills for Empowering the Internet Generation", 11th Edition, Tata McGraw-Hill. 2006.
- 6. Dr A. Ramakrishna Rao, Dr G.Natanam & Prof S.A.Sankaranarayanan, "English Language Communication : A Reader cum Lab Manual", Anuradha Publications, Chennai, 2006.
- 7. Dr. Shalini Verma, "Body Language- Your Success Mantra", S.Chand, 2006.
- 8. Andrea J. Rutherford, "Basic Communication Skills for Technology", 2nd Edition, Pearson Education, 2007.

DISTRIBUTION AND WEIGHTAGE OF MARKS

Business English and Technical Writing Examination

For Business English and Technical Writing subject, there shall be continuous PC based evaluation during the semester for 80 marks and viva voce to be conducted by an external examiner for 20 marks.

CE218 : MECHANICS OF SOLIDS AND FLUIDS LAB (MSF(P)) (For ME -IV Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

L	T/D	Ρ	С
-	-	2	2

Course Outcomes:

At the end of the course students will be able to

- 1. To gain knowledge on working of centrifugal pumps, submersible pump and reciprocating pump.
- 2. To gain the knowledge of various flow meters and the concept of fluid mechanics.
- 3. The students will be able to understand procedures for conducting tensile, torsion tests on mild steel specimens
- 4. Determine the Young's modulus using deflection test on beams and tensile test on rods, tension and compression test on springs, and impact tests on steel.

LIST OF EXPERIMENTS

1. a) Determination of coefficients of discharge, velocity and contraction for a small orifice by 'Constant head method'.

b) Determination of coefficient of discharge for an external mouthpiece by 'Constant head method'.

- 2. Determination of friction factor for a given pipe line.
- 3. a) Calibration of Venturimeter.b) Calibration of Orificemeter.
- 4. Performance test on single stage centrifugal pump.
- 5. Performance test on submersible pump.
- 6. Performance test on Reciprocating pump.
- 7. To study the stress-strain characteristics of Mild steel rod using Universal Testing Machine.
- 8. To find the modulus of elasticity of given material by measuring deflection in simply supported beam.
- 9. To find the modulus of rigidity of given material using Torsion Testing Machine.
- 10. To find the modulus of rigidity of given material using Spring Testing Machine.
- 11. To find modulus of elasticity by conducting flexural test on carriage spring.
- 12. (a) To find Rock well hardness number of given material
 - (b) To find impact strength (Izod & Charpy) using impact testing machine.

ME212: MACHINE TOOLS LAB (MT(P)) (For ME -IV Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

L	T/D	Ρ	С
-	-	2	2

Course Outcomes:

At the end of the course students will be able to

- 1. Perform taper turning, step turning, eccentric turning and thread cutting on cylindrical work piece using lathe machine.
- 2. Perform drilling, shaping, milling and slotting operations on work piece using relevant machine tools.
- 3. Prepare single point cutting tools using Tool and cutter grinder.
- 4. Prepare pattern for casting

LIST OF EXPERIMENTS

- 1. Step turning
- 2. Taper turning by compound swivel method
- 3. Eccentric turning
- 4. Right hand thread cutting and Left hand thread cutting
- 5. Making of a Single point cutting tool by formed grinding wheel on tool cutter grinder.
- 6. Drilling, reaming, tapping and counter sinking
- 7. Pattern making
- 8. V- groove cutting on shaper.
- 9. Key way cutting on slotting machine and Spur gear cutting on milling machine
- 10. Wood turning
- 11. Alignment Tests on Lathe Machine
- 12. Alignment Tests on Radial Drilling Machine

ME213: COMPUTER AIDED DRAFTING (CAD(P)) (For ME -IV Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Understand various AUTOCAD features.
- 2. Draw 2D models using AUTOCAD
- 3. Draw 3D components using AUTOCAD

LIST OF EXPERIMENTS

2D Drafting: AUTO CAD

- 1. Introduction to CAD software
- 2. Exercise on usage of Auto CAD 2D Drawing Commands
- 3. Exercise on usage of Auto CAD 2D Editing Commands
- 4. Exercise on usage of Auto CAD 2D dimension commands
- 5. Exercises on Auto CAD 2D Drawings -I
- 6. Exercises on Auto CAD 2D Drawings II
- **3D Drafting : AUTO CAD**
- 7. Introduction to 3D Modeling Using Autocad Software
- 8. Modeling of Component in 3D V block
- 9. Modeling of Component in 3D Open Bearing
- 10. Modeling of Component in 3D Angular block
- 11. Modeling of Component in 3D Dovetail Guide
- 12. Modeling of Component in 3D Dovetail Bracket
- 13. Modeling of Component in 3D Dovetail stop

L	T/D	Р	С

FOUR YEAR B.Tech DEGREE COURSE

Scheme of instruction and Examination

(Effective from 2013-14)

V Semester (ME)

Scheme :2013

S. No	Subject			Sche	eme	of	Duration of end	Scheme	e of nation	
110	U U	Code	Credit	L	D/T	Р	Exam	End	Intern	Total
Ι	Theory									
1	Industrial Engineering & Management	ME301	3	3	-	-	3	70	30	100
2	IC Engines & Gas Turbines	ME302	3	3	1	-	3	70	30	100
3	Instrumentation & Control	ME303	3	2	1	-	3	70	30	100
4	Engineering Metrology	ME304	3	3	-	1	3	70	30	100
5	Dynamics of Machines	ME305	3	3	1	-	3	70	30	100
6	Design of Machine Members – I	ME306	3	3	1	-	3	70	30	100
7	Soft Skills	ML202	2	1	2	-	-	-	100	100
Π	Practical									
8	Geometric Modeling Lab	ME307	2	-	-	3	3	70	30	100
9	Thermal Engineering Lab	ME308	2	-	-	3	3	70	30	100
	Total		24	18	6	6	-	560	340	900
ME301: INDUSTRIAL ENGINEERING & MANAGEMENT (IEM) (For ME -V Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

L	T/D	Ρ	С
3	-	-	3

Course Outcomes:

At the end of the course students will be able to

- 1. Understand management concepts and personnel management
- 2. Prepare plant layout using concepts of plant location, plant layout and material handling.
- 3. Understand work study and work measurement concepts.
- 4. Solve project management problems using CPM and PERT techniques.
- 5. Understand industrial acts including industrial dispute act and workman compensation act.

Unit - I

Management: Introduction to Management, Scientific Management, Systems approach to Management, MBO, Decision Making Process.

Personnel Management: Functions of personnel management, types of training, Job evaluation and Merit rating, Collective bargaining and labour participation in management.

Unit - II

Plant Location: Factors affecting plant location, Comparison between urban and rural location, Breakeven analysis- Mathematical method, Graphical Method, Assumptions, Applications, Limitations.

Plant Layout: Plant layout objectives, Types of layouts, merits and demerits, Factors governing the design of layout, Muthor's principles of plant layout. Objectives and principles of materials handling, types of material handling equipment.

Unit - III

Work Study: Introduction to method study, Steps in method study, Recording techniques-Flow process chart, String diagram,; Therbligs, Principles of motion economy.

Unit – IV

work measurement: Stop watch time study, Standard time calculation. Work sampling-procedure, applications, advantages and disadvantages, Wages and incentives, types of incentive plans.

Unit-V

Project management: Introduction, Rules for drawing network diagram, Project Evaluation & Review Technique (PERT), Event time computations-Earliest expected time and latest allowable Occurrence time, Slack, Critical Path, Critical Path method (CPM), Activity time estimates (EST,EFT,LST,LFT) and determination of Total Float, Free Float, Independent float, crashing of network.

Unit – VI

Plant Maintenance: Objectives, Functions and Types of plant maintenance.

Industrial Acts: Industrial safety, Accidents prevention and control, Factories act, Workmen compensation act, Industrial disputes act.

Text Books:

- 1. M.Mahajan, Industrial Engineering and production management, Dhanpat rai & sons, New Delhi
- 2. S.K.Sharma and Savita sarma, Industrial Engineering and organization management, SK Kataria & Sons, New Delhi.
- 3. Mart and T Telsang, Industrial and Business Management, S. Chand Publishers, New Delhi.

Reference Books :

1.Banga & Sharma, *Industrial Engineering and Management*, Khanna Publishers, New Delhi. 2.ILO, *Introduction to Work Study*, Universal Publications, Mumbai.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME302: IC ENGINES & GAS TURBINES (ICGT) (For ME -V Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the working of IC engines and its components.
- 2. Determine the performance parameters of IC engines.
- 3. Understand the combustion process of SI engines and CI engines.
- 4. Solve problems on Reciprocating, centrifugal and axial flow air compressors.
- 5. Understand the working of gas turbines and its performance
- 6. Understand the working of jet propulsion and its parameters.

Unit – I

I.C. Engines : Energy conversion, basic engine components, Working principle of engines - two stroke and four stroke engines, SI and CI engines, Classification of I.C. Engines, Valve and port timing diagrams, comparison of two stoke and four stroke engines, comparison of SI and CI engines, application of I.C engines.

Engine Performance Parameters: The First law analysis of engine cycle, Brake power, indicated power, friction power, mean effective pressure, engine efficiencies, performance calculations, Heat balance.

Unit – II

Measurements and Testing: Measurement of Brake power – Rope brake, hydraulic, Eddy current and swinging field DC dynamometers; Friction power – Willian's line method, Morse test, motoring test and retardation test.

Unit – III

Combustion in S.I Engines: Homogeneous and heterogeneous mixtures, principle of carburetion, stages of combustion in S.I Engines, , knocking.

Combustion in C.I Engines: Disintegration of fuel jet, stages of combustion, knocking.

Super Charging: types of superchargers, advantages and limitations of super charging.

Unit – IV

Reciprocating air Compressors: Introduction and classification of compressors, mechanical details and working principle of a single stage reciprocating compressor, equation for work, effect of clearance volume, isothermal, adiabatic, and volumetric efficiencies, two-stage compression, Condition for minimum work.

Centrifugal& Axial flow Compressors: introduction, essential parts of a centrifugal compressor, principle of operation. – Introduction to axial flow compressor, geometry and working principle.

Unit – V

Gas Turbines : Simple Gas Turbine, ideal cycle, essential components, open and closed cycle arrangements, requirements of working medium, applications of Gas Turbines, comparison of Gas Turbines with reciprocating engines, work output and efficiency of a simple Gas Turbine cycle, optimum pressure ratio for maximum specific output, Gas Turbines with regeneration, reheating

L	T/D	Р	С
3	1	-	3

and intercooling.

Unit – VI

Jet Propulsion : Introduction to Propeller engines and Gas Turbine engines, working principle of Ramjet engine, Pulse jet engine, Turboprop engine and Turbojet engine, Thrust and thrust equation, specific thrust, parameters affecting flight performance, introduction to Rocket propulsion, classification of Rockets and principle of Rocket propulsion,

Text Books :

1. V.Ganeshan, Internal Combustion Engines, TMH Publishers, New Delhi.

2. V.Ganeshan, Gas Turbines, TMH Publishers, New Delhi..

Reference Books :

1. R.K Rajput, *Thermal Engineering*, Lakshmi Publications, New Delhi.

2. S. L. Soma Sundaran, Gas dynamics and Jet Propulsion, NAI Publishers, New Delhi.

3. P.L. Ballaney, Thermal Engineering, Khanna Publishers, New Delhi.

4. Sarvanamutto and GFC Rogers, Gas Turbine Theory, Pearson Education, New Delhi.

Data Handbook : B.Sreenivasa Reddy & K.Hemachandra Reddy, Thermal data hand book, IK international Publishers, Bangalore

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME303: INSTRUMENTATION & CONTROL SYSTEMS(INCS) (For ME -V Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

L	T/D	Р	С
2	1	-	3

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the basic principles of measurement and mechanical, electrical measuring instruments.
- 2. Understand the working of measuring instruments for pressure, flow, and temperature.
- 3. Understand the working of measuring instruments for force, torque, acceleration and strain.
- 4. Understand the basic principle of control systems and mathematical models of mechanical, electrical, thermal, hydraulic and pneumatic systems
- 5. Solve the problems on performance of control systems using first and second order response, routh-hurwitz criterion and bode plots.

Unit - I

Measurement and Instrumentation: Measurement, measurement methods, generalized measurement system and its functional elements, classification of instruments, error and its classification, static and dynamic characteristics, **Sensors and Transducers:** Introduction, mechanical detector transducer elements, electrical transducers, transducers classification and description, transducer sensitivity, variable resistance transducers, variable inductance transducers, capacitive transducers, LVDT, piezo electric and photo electric transducers.

Unit – II

Measurement of Pressure, Flow and Temperature : Pressure measurement terms, measurements of low pressure gauges such as McLeod gauge, thermal conductivity gauge, Ionization gauge, measurement of high pressure such as Bourdon gauge, resistance gauge, CRO for varying pressure measurement.

Classification of flow measurement techniques, special flow meters such as Turbine flow meter, Magnetic flow meter, Hot wire anemometer, Ultrasonic flow meter. Temperature measurement instruments, thermocouples, resistance thermometers and thermistors, radiation and optical Pyrometers.

Unit – III

Measurement of Force, Torque, Acceleration : Basic force measurement methods such as elastic load cells, elastic strain gauge load cells, hydraulic and pneumatic load cells, Torque measurement, different types of torsion meters, piezo electric accelerometer, seismic accelerometer, strain gauge accelerometer.

Unit – IV

Strain Gauges and Measurement : Strain measuring techniques, requirement of strain gauges, resistance strain gauges, strain gauges alloys and material, bonded and unbonded strain gauges, bonding techniques, temperature compensation in strain gauges.

Unit – V

Control Systems, Mathematical Models and Transfer Function : Introduction, examples of control systems, classification of control systems, open loop and closed loop control systems, control system terminology, servomechanism.

Physical system and mathematical models, mechanical systems, thermal systems, electrical systems, hydraulic and pneumatic systems, linear control system, transfer function, block diagram and its reduction process, signal flow graphs, mason's rule.

Unit - VI

Performance of Control Systems : Standard test inputs, response of first order control systems, performance of second order control systems, properties of transient response, steady state error and error constants, Concept of stability, necessary conditions for stability, relative stability, Routh-Hurwitz stability criterion, bode plots, gain and phase margin.

Text Books :

1. Beckwith and Buck, Mechanical Measurements, Narosa Publication, New Delhi.

2. S. Ghosh, *Control Systems – Theory & Applications*, Pearson Education, New Delhi. **Reference Books :**

- 1. D.S. Kumar, Mechanical Measurements and Control, Metropolitan Books, New Delhi.
- 2. B.S.Manke, Linear Control Systems, Khanna Publishers, New Delhi.
- 3. Doeblin.E.O., *Measurement Systems*, TMH Publishers, New Delhi.
- 4. Nagarath and Gopal, Control System Engineering, Narosa Publishers, New Delhi.
- 5. Naresh K. Sinha, *Control Systems*, NAI Publishers, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME304: ENGINEERING METROLOGY (EMT) (For ME -V Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the Line, End, Wave Length standards, Principles of Limits, Fits, Gauges and design the limit gauges.
- 2. Identify the methods and devices for linear and angular measurement
- 3. Understand the Terminology of Screw threads and measure Minor, major, Effective Diameters.
- 4. Understand the Terminology of gears, measure tooth thickness, pitch, profile, and test gear using Parkinson gear tester.
- 5. Understand the terminology of Surface Roughness, working of Tomlinson surface meter, Taylor- Hobson- Talysurf and Interferometry.
- 6. Identify the alignment tests to be conducted on lathe and understand the working of Coordinate Measuring Machines and nanometrology.

Unit - I

Standards of Measurements : Line standards, End standards and Wave length standards

Limits, Fits and Gauges: Tolerances, limits and Fits, Basic types fits, Interchangeable and Selective assemblies, Systems of limits and fits as exemplified in British, International and Indian standards for Plain work, Limit gauging- Plug, ring and gap gauges, Taylor's principle of limit gauges. Problems on limits, fits and design of GO and NO GO gauges.

Unit - II

Precision Measurement : Construction and typical uses of Dial indicators, Comparators-Mikrokator comparator, Sigma comparator, optical comparator, Electrical comparator, Solex pneumatic comparator and Tool Makers microscope and its applications.

Angular Measurement : Bevel protractor, Clinometer, angle dekkor, Sine bar, Spirit level, Auto collimator, Applications of Slip gauges, rollers and balls in testing of tapers.

Unit - III

Screw Thread Measurement : Terminology of screw threads, effect of pitch errors and angle errors, concept of virtual effective diameter, Measurement of major, minor and effective diameter.

Unit - IV

Measurement of Gears: Terminology of gear tooth, tooth to tooth pitch measurement, profile checking, tooth thickness measurement and Parkinson gear tester.

Unit – V

Measurement of Surface Finish : Significance of surface finish, order of geometrical errors occurring during machining, magnitude, sample length, methods of measuring surface finish-stylus probe instruments, Tomlinson surface meter and Taylor- Hobson- Talysurf.

Interferometry : Interference of light, optical flat and its uses, Michelson interferometer, NPL flatness interferometer, NPL gauge interferometer.

L	T/D	Ρ	С
3	-	-	3

Unit - VI

Alignment Tests on Lathe : Levelling of the machine, True running of locating cylinder of main spindle, True running of headstock center, Parallelism of the main spindle to saddle movement, True running of taper socket in main spindle, Parallelism of tail stock guide ways with the movement of carriage, Parallelism of tailstock sleeve taper socket to saddle movement, Alignment of both the centers in vertical plane, Axial slip of lead screw.

Co ordinate Measuring Machines : CMM construction, Possible sources of error in CMM, Accuracy specifications of coordinate measuring machines, Advantages of CMM. Introduction to Micro and Nano Metrology.

Text Book :

R.K.Jain, *Engineering Metrology*, Khanna Publishers, New Delhi.
Reference Books:
ASTME, *Hand Book of Industrial Metrology*, PHI Publication, New Delhi.

2. P.C.Sharma, A textbook of Production Engineering, S. Chand Publishers, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME305: DYNAMICS OF MACHINES (DOM) (For ME -V Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Construct cam profile for knife edge, roller, flat faced follower with uniform velocity, simple harmonic, uniform acceleration and uniform retardation and cycloid motion.
- 2. Solve problems on simple pendulum, compound pendulum, dynamically equivalent system, inertia force of reciprocating engine.
- 3. Determine fluctuation of energy of a flywheel.
- 4. Understand the concept of gyroscopic action and solve related problems on the stability of ships, planes, two wheel and four wheel automobiles.
- 5. Understand the concept of balancing of rotating and reciprocating masses of an engine.
- 6. Understand the working principle of watt, porter, proell and hartnell governors and to solve their related problems.

Unit – I

Cams: Types of cams, types of followers, terminology of cam and follower, types of motion of the follower - uniform velocity, simple harmonic motion, uniform acceleration and retardation and cycloidal motion. Drawing of cam profile for knife edge, roller and flat faced reciprocating follower for the given motion. Cam profile with offset roller follower.

Unit - II

Inertia Force Analysis: D'Alembert's Principle, simple and compound pendulum, equivalent dynamic system, correction couple, Klein's construction for velocity and acceleration, velocity and acceleration of piston, angular velocity and angular acceleration of connecting rod, piston effort, crank effort, turning moment on crank shaft, Inertia of a connecting rod.

Unit – III

Flywheel : Function of fly wheel, co-efficient of fluctuation of energy and speed in flywheels, relation between fluctuation of speed and energy, size of flywheel, flywheel in punching press.

Unit – IV

Gyroscopic Effects: Introduction, Gyroscopic couple, effects of gyroscopic couple on an aeroplane, gyroscopic effects on a naval ship during steering, pitching and rolling, stability of four wheel automobile moving in a curved path, Stability of a two wheel vehicle taking a turn.

L	T/D	Р	С
3	1	-	3

Unit – V

Balancing of Rotating Masses: Static Balancing, dynamic balancing, balancing of several masses in different planes.

Balancing of Reciprocating Masses: Balancing of reciprocating masses, partial balancing of locomotives, effects of partial balancing in locomotives, secondary balancing, balancing of inline engines and balancing of V-engines.

Unit – VI

Governors: Types of Governors, Watt governor, Porter governor, Proell governor, Hartnell governor, sensitiveness of a governor, hunting, isochronism, stability, effort of a governor, power of a governor, controlling force.

Text Books :

- 1. S.S. Rattan, *Theory of Machines*, TMH Publishers, New Delhi.
- 2. Sadhu Singh, *Theory of Machines*, Pearson Education, New Delhi.

Reference Books:

- 1. Ballaney, *Theory of Machines*, Khanna Publishers, New Delhi.
- 2 Thomas Bevan, *Theory of Machines*, CBS Publishers, New Delhi.
- 3. J.S. Rao and R.V. Dukkipati, *Mechanisms and Machine Theory*, NAI Publishers, New Delhi.
- 4. J.E Shigley, Theory of Machines and Mechanisms, TMH Publishers, New Delhi

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME306: DESIGN OF MACHINE MEMBERS - I (DMM1) (For ME -V Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. To understand the fundamentals of machine design includes design procedure and types, factor of safety, material selection and theories of failure.
- 2. To apply design concepts in designing components subjected to static and variable load.
- 3. To apply design concepts for designing of bolted joints subjected to direct and eccentric loading.
- 4. To apply design concepts for designing of welded and riveted joints subjected to direct and eccentric loading.
- 5. To apply design concepts for designing of keys, cotter and knuckle joints and pulleys.

Unit – I

Design Methods: The art and science of machine design, types of design methods, stages in machine design, selection of materials, types of loads and factor of safety.

Theories of Failure: Maximum Principal stress theory, Maximum shear stress theory, Maximum principal strain theory, Maximum strain energy theory, Maximum distortion energy theory, impact loads.

Unit – II

Strength of Machine Elements : Stress Concentration, theoretical stress concentration factor, fatigue stress concentration factor, design for fluctuating stresses, endurance limit, S-N curves, Goodman's line, soderberg's line.

Unit – III

Bolted Joints: Bolted joints, stresses in bolts, bolts of uniforms strength bolted joints under eccentric loading.

Unit – IV

Riveted Joints : Types of riveted joints, modes of failure, strength and efficiency of riveted joints, pitch of the rivets, design stresses, boiler joints, diamond joints, and riveted joints under eccentric loading.

Welded Joints: Types of welded joints, strength of welds, Design of simple welded joints. Unit – V

Keys, Cotters and Knuckle Joints: Types of Keys, stresses in Keys, design of rectangular, square and taper Keys, design of standard cotter and knuckle joints.

Unit – VI

Design of belt drives: Design of flat belt drive, V-belt drive, design of CI pulleys.

L	T/D	Ρ	C
3	1	-	3

Text Books :

- 1. R.K. Jain , Machine Design, Khanna Publishers, New Delhi.
- 2. V.B.Bhandari, Design of Machine Elements, TMH Publishers, New Delhi.

Reference Books :

- 1. Schaum's series , Machine Design, TMH Publishers, New Delhi.
- 2. Sadhu Singh, Machine Design, Khanna Publishers, New Delhi.
- 3. Joseph E. Shigely, Mechanical Engineering Design, TMH Publishers, New Delhi.
- 4. M.F. Spotts, Design of Machine Elements, PHI Publishers, New Delhi.
- 5. Pandya and Shah, Machine Design, Charotar Publishers, Anand.

Data Hand Book :

1. Mahadevan and Balaveera Reddy [1996], Machine Design Data Hand Book, CBS Publishers, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ML202:<u>SOFT SKILLS (SS)</u> (Common to B.Tech V Semester CIVIL, EEE & ME)

Scheme : 2013	L	T/D	Р	С
Internal Assessment : 100	1	2	-	2

The purpose of this course is to provide exposure to the students to the soft skills that are crucial to an employee's ability to work EFFECTIVELY.

Course Outcomes:

At the end of the course students will be able to

- 1. Students will be able to demonstrate the competence to use grammar with an understanding of its basic rules
- 2. Students will be able to communicate effectively and enhance their interpersonal relationship building skills with renewed self confidence
- 3. Students will be able to work together in teams and accomplish objectives in a cordial atmosphere
- 4. Students will be able to face interviews, GDs and give presentations
- 5. Students will be able to understand and develop the etiquette necessary to present themselves in a professional setting

Course Work

To achieve the objectives, the following course content is prescribed.

Contents

- Revision and reinforcement of language skills grammar vocabulary
- Communication Skills Barriers to Communication Strategies to overcome the barriers
- Non Verbal Communication Body Language Proxemics Kinesics
- Emotional Quotient self analysis of emotional responses
- Group Discussions understanding the objective and skills tested in a GD types of GDs – roles in a GD – dos and don'ts in a GD
- Team Work importance of team work team vs group attributes of a successful team working with groups dealing with people group decision making
- Goal Setting importance of goal setting difference between goals and dreams importance of writing goals SMART goals short term goals long term goals
- Time Management scheduling how to delegate effectively plugging time leaks learning to say "No"
- Presentation Skills Oral Presentations PPTs Prepared Speeches Extempore
- General Awareness & Current affairs
- Business Etiquette telephone and email etiquette dining etiquette dos and don'ts in a formal setting

References

- 1. Stephen R. Covey, "The Seven Habits of Highly Effective People", Pocket Books Publishers, London
- 2. Infosys Campus Connect Portal -//http::campusconnect.infosys.com//
- 3. Shiv Khera, "You Can Win", MacMillan India Publishers, New Delhi
- 4. Stephen R. Covey, A. Roger Merrill and Rebecca R. Merril, "First Things First", Pocket Books Publishers, London
- 5. Gloria J.Galanes, Katherine Adams, John K Brillhart, "Effective Group Discussion: Theory and Practice".
- 6. Priyadarshani Patnaik, "Group Discussion and Interview Skills with VCD", Foundation Books.
- 7. Sangeeta Sharma & Binod Mishra, "Communication Skills for Engineers and Scientists", PHI Learning Private Limited.
- 8. Dr. Shalini Verma, "Body Language- Your Success Mantra", S.Chand, 2006.
- 9. Andrea J. Rutherford, "Basic Communication Skills for Technology", 2nd Edition, Pearson Education, 2007.
- 10. Krishna Mohan and Meera Bajerji, "Developing Communication Skills", MacMillan India Ltd.

DISTRIBUTION AND WEIGHTAGE OF MARKS

For the Soft Skills subject there shall be continuous tests for 50 marks and viva-voce for 50 marks.

ME307: GEOMETRIC MODELING LAB (GM(P)) (For ME -V Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Understand features of CATIA and Creo software.
- 2. Model 3D components using CATIA
- 3. Model 3D components using Creo
- 4. Create assembly of machine component using Creo

LIST OF EXPERIMENTS

1.. Part Modeling:

- a)Modeling of a Component in 3D V block
- b) Modeling of a Component in 3D Open Bearing
- c) Modeling of a Component in 3D Angular block
- d) Modeling of a Component in 3D Dovetail Guide
- e) Modeling of a Component in 3D Dovetail Bracket
- f) Modeling of a Component in 3D Dovetail stop

2...Assembly Modeling:

- a) Assembly of a screw jack parts
- b) Assembly of a knuckle joint
- c) Assembly of a Oldham's coupling
- d) Assembly of a footstep bearing
- e) Assembly of a stuffing box
- f) Assembly of a square tool post

L	T/D	Ρ	C
-	-	2	2

ME308: THERMAL ENGINEERING LAB (TE(P)) (For ME -V Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Determine flash and fire point of fuels.
- 2. Evaluate Performance chararistics of four stroke diesel engines using hydraulic, mechanical and generator loading.
- 3. Prepare heat balance sheet for four stroke diesel engine
- 4. Evaluate Performance chararistics of blower and compressor.

LIST OF EXPERIMENTS

- 1. Determination of Viscosity of Liquid fuels / Lubricants.
- 2. a) Determination of flash and fire points fuels / lubricants.b) Determination of calorific value of gaseous fuels.
- 3. To Study mechanical details and operation of I.C. Engines and draw valve timing diagram.
- 4. To Conduct Performance Test on 10 HP Diesel Engine with hydraulic dynamometer
- 5. To conduct Performance Test on VCR Engine.
- 6. To conduct Heat Balance Test on 5 HP Diesel Engine with generator loading
- 7. To Conduct Retardation Test on 5 HP Diesel Engine with rope brake dynamometer
- 8. To Conduct Morse Test on MPFI Multi Cylinder Petrol Engine
- 9. a) To conduct performance, heat balance test and draw P-V and P-theta
- diagrams on Computerized diesel engine test rig. `
 - b) To measure emissions of I.C engines using Emission Gas Analyzer
- 10. Test on Two-stage reciprocating air compressor
- 11. Test on Blower Test Rig

12. Determination of Lift, Drag force, P-V distributions on bodies with different geometries using low speed Wind Tunnel.

L	T/D	Ρ	С
-	-	2	2

FOUR YEAR B.Tech DEGREE COURSE Scheme of instruction and Examination (Effective from 2013-14)

VI Semester (ME)

Scheme :2013

G		0.1		Sche	me	of	Duratio	Schem	e of	
S.		Code	Credit	Instruction		n of end	End	Intern	Total	
No	Subject		s	L	D/T	Р	Exam (Hours	Exam	al	1000
Ι	Theory									
1	Refrigeration & Air	ME309	3	2	1	-	3	70	30	100
	Conditioning									
2	Operations Research	ME310	3	3	1	_	3	70	30	100
3	Heat Transfer	ME311	3	3	1	-	3	70	30	100
4	Fundamentals of Tool Design	ME312	3	3	-	-	3	70	30	100
5	Design of Machine Members –	ME313	3	3	1	-	3	70	30	100
	II									
6	Inter Disciplinary elective		3	2	2	-	3	70	30	100
II	Practical									
7	Engineering Metrology Lab	ME314	2	-	-	2	3	70	30	100
8	Data Base & Computation lab	ME315	2	-	-	2	3	70	30	100
9	Heat Transfer Lab	ME316	2	-	-	2	2	70	30	100
	Total		24	16	6	6	-	630	370	900

ME309: REFRIGERATION AND AIR CONDITIONING (RAC) (For ME –VI Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

L	T/D	Ρ	C
2	1	-	3

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the basic refrigeration methods include Vapor compression refrigeration, Gas refrigeration and their applications.
- 2. Understand the vapor absorption refrigeration and Classify the commonly used refrigerants and their environmental effects.
- 3. Describe components of refrigeration system and their working principles.
- 4. Understand properties of moist air, psychometric chart and needs of human comfort
- 5. Solve heating & cooling load problems under environmental and inside conditions.

Unit – I

Introduction – Thermal principles, applications of Refrigeration & Airconditioning, methods of refrigeration.

Vapor compression refrigeration system- Carnot refrigeration cycle, Wet compression & dry compression, Standard vapour-compression cycle, P-H, & T-S diagrams, effect of sub-cooling and super-heating, actual vapour-compression cycle.

Unit – II

Gas cycle refrigeration – Limitations of Carnot cycle, Bell Coleman cycle, analysis of simple aircraft refrigeration cycle.

Refrigerants: Classification of refrigerants, designation of refrigerants, properties of an ideal refrigerant, Environmental effects of CFC refrigerants, substitutes for CFC refrigerants

Unit – III

Components: Compressors – General classification – comparison, advantages and disadvantages, Evaporators – classification – working, Condensers – classification – working, Expansion devices- types –working.

Unit – IV

Vapour Absorption Refrigeration system: Introduction – Basic absorption refrigeration system, actual Ammonia absorption refrigeration system, Lithium-Bromide absorption refrigeration system, three fluid absorption refrigeration system, comparison of compression and absorption refrigeration systems.

Other Refrigeration systems: Working principles of Steam jet refrigeration system, Thermoelectric refrigerator, Vortex & Pulse tube refrigerators (only theoretical concepts).

UNIT-V

Air conditioning: Psychrometric properties, Psychrometric chart, basic processes in conditioning of air, bypass factor, simple air conditioning system, human comfort and effective temperature, industrial air conditioning.

Unit – VI

Cooling & Heating load calculations: Summer air-conditioning, apparatus dew point, RSHF, GSHF, effect of bypass factor, Winter air conditioning, Infiltration and ventilation loads, internal loads, simple problems on load calculations.

Text Books:

1. C.P.Arora, *Refrigeration and Air Conditioning*, TMH Publishers, New Delhi.

2. Barron R.F., Cryogenic Systems, Oxford University Press, New York.

Reference Books:

1 Dossat, *Principles of Refrigeration*, Pearson Education, New Delhi.

2 Manohar Prasad, *Refrigeration and Air Conditioning*, NAI Publishers, New Delhi.

Data Handbook : B.Sreenivasa Reddy & K.Hemachandra Reddy [2007], *Thrmal data hand book, IK International Publishers, Bangalore*

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME310: OPERATIONS RESEARCH (OR) (For ME -VI Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Formulate the mathematical models of stated problems
- 2. Solve linear programming problems with '=', ' \geq ' and/or ' \leq ' type of constraints using graphical and simplex methods.
- 3. Solve gaming problems using dominance rule, algebraic and graphical methods.
- 4. Determine optimal replacement periods to replace the items that deteriorate gradually and that fail suddenly.
- 5. Apply suitable algorithms/methods including Transportation, Assignment, Johnson's algorithm in Sequencing problems, Monte-carlo algorithm in Simulation, to determine better solutions of problems.
- 6. Identify the classification of the given problem and solve the single server model with infinite and finite population; and multiple parallel servers model with infinite population.

Unit- I

Introduction: Definition, Basic OR models & Applications of OR.

Linear Programming : Introduction, Formulation of linear programming problems, Graphical method of solving LP problem, simplex method, Artificial variable Technique, Degeneracy in LP, Duality, unbounded infeasible and multiple optimum solution.

Unit-II

Transportation Models: Finding an initial feasible solution – North West Corner method, Least cost method, Vogel's Approximation Method, Finding the optimal solution using MODI method, Special cases in Transportation problems - Unbalanced Transportation problem, Degeneracy in transportation problem, multiple optimal solutions, prohibited routes.

Unit-III

Assignment problems: Hungarian method of Assignment problem, maximization in Assignment problem, unbalanced Assignment problem, prohibited Assignments, multiple optimum solutions.

Replacement Modes: Introduction, replacement of items that deteriorate ignoring change in money value, replacement of items that deteriorate considering change in money value with time, replacement of items that fail suddenly – Individual replacement policy, Group replacement policy.

L	T/D	Ρ	С
3	1	-	3

Unit-IV

Game Theory : Introduction, Two-person zero sum games, Maxi-min and Mini-max principle, Principle of dominance, solution of mixed strategy problems, Graphical method for $2 \times n$ and m x 2 games..

Simulation : Introduction, Definition, Types of Simulation, Monte-Carlo Simulation, Pseudo Random Numbers, Mid-square Method of Generating Random Numbers, Application of simulation to inventory control and queuing problems.

Unit-V

Sequencing Models: Introduction, General Assumptions, Priority rules for job sequencing (Single machine Scheduling), Measures of Performance- Average Completion Time, Average Lateness, Processing n jobs thorough 2 machines, Processing n jobs through 3 machines, Processing n jobs thorough m machines, Processing 2 jobs through m machines.

Unit-VI

Queuing Theory: Introduction, Single Channel – Poisson arrivals – Exponential service times with infinite population & finite population, Multi channel – Poisson arrivals – Exponential service times with infinite population.

Text Books:

- 1. S.D. Sarma, Operations Research, Kedarnnath, Ramnath & Co., Meerut.
- 2. Hiller and Liberman, Operations Research, TMH Publishers, New Delhi.

Reference Books:

- 1. N.D. Vohra, *Quantitative Techniques in Management*, TMH Publishers, New Delhi.
- 2. V.K.Kapoor, *Operations Research*, S. Chand Publishers, New Delhi.
- 3. Prem Kumar Gupta and Hira, *Operations Research*, S. Chand Publishers, New Delhi.
- 4. Jerry Banks-Discrete Event Simulation, PHI publishers, New Delhi
- 5. Hamdy, A. Taha, Operations Research-An Introduction, Prentice Hall of India Pvt. Ltd.,

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME311: HEAT TRANSFER (HT) (For ME -VI Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the modes of heat transfer and their applications
- 2. Solve problems on one dimensional steady state, multilayer and transient conduction with heat generation
- 3. Determine rate of heat dissipation from extended surface
- 4. Solve problems on forced and free convection heat transfer for internal and external flows
- 5. Predict radiation heat transfer between black and grey surfaces
- 6. Analyze performance of heat exchanger using NTU and LMTD methods

Unit – I

Introduction and Basic Concepts: Application areas of heat transfer, Modes and Laws of heat transfer, Three dimensional heat conduction equation in Cartesian & Cylindrical coordinates and their simplified equations, thermal conductivity, thermal diffusivity.

One dimensional steady state heat conduction without heat generation: Heat conduction in plane walls, composite slabs, composite cylinders, composite spheres, electrical analogy, concept of thermal resistance and conductance, critical radius of insulation for cylinders and spheres, economic thickness of insulation.

Unit – II

One dimensional steady state heat conduction with heat generation: Heat conduction with uniform heat generation in plane wall, cylinder & sphere with different boundary conditions. **Transient heat conduction:** Validity and criteria of lumped system analysis & Semi-infinite

bodies, Biot and Fourier numbers.

Unit – III

Extended Surfaces : Types of fins, governing equation for constant cross sectional area fins, solution (with derivation) for infinitely long fins and short fins (without derivation), efficiency & effectiveness of fins.

Unit – IV

Fundamentals of convection: Mechanism of natural and forced convection, local and average heat transfer coefficients, concept of velocity & thermal boundary layers, dimensional analysis.

Forced convection: Dimensionless numbers and their physical significance, empirical Correlations for external & internal flow for both laminar and turbulent flows.

Natural convection: Introduction, dimensionless numbers and their physical significance, empirical correlations for natural convection.

L	T/D	Ρ	С
3	1	-	3

Unit –V

Radiation: Fundamental concepts of radiation, different laws of radiation, radiation shape factor, heat exchange by radiation between two black and diffuse gray surfaces, electrical network analogy, radiation shields.

Unit –VI

Heat exchangers: Classification and applications, heat exchanger analysis – LMTD for parallel and counter flow heat exchanger, effectiveness– NTU method for parallel and counter flow heat exchanger, introduction to cross flow heat exchanger, LMTD correction factor, introduction to heat pipe.

Condensation and Boiling: Boiling heat transfer, types of boiling, pool boiling curve and forced boiling phenomenon, condensation heat transfer, film wise and drop wise condensation [Only theoretical concepts (No numerical treatment)].

Text Books:

1. J.P. Holman, Heat Transfer, TMH Publishers, New Delhi.

2. R.C. Sachdeva, Engineering Heat and Mass Transfer, NAI Publishers, New Delhi.

Reference Books :

1. M.N. Ozisik , *Elements of Heat Transfer*, McGraw-Hill Publishers, New York.

- 2. F.P. Incropera, *Introduction to Heat Transfer*, John Wiley Sons Publishers, New York.
- 3. Donald Pitts, Heat Transfer, McGraw Hill Publishers, New York.
- 4. M. Thirumaleshwar, *Fundamentals of Heat and Mass Transfer*, Pearson Education, New Delhi.

Data Handbook: B.Sreenivasa Reddy & K.Hemachandra Reddy [2007], *Thermal data hand book, IK International Publishers, Bangalore*

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME312: FUNDAMENTALS OF TOOL DESIGN (FTD) (For ME -VI Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the metal cutting mechanics and nomenclature of cutting tools and Determine the cutting forces in metal cutting.
- 2. Understand the tool wear concept, tool life estimation, significance of cutting parameters on tool life and solve the problems related to the above concepts.
- 3. Understand the properties of cutting tool materials, cutting fluids and economics of metal cutting
- 4. Understand the press working terminology, sheet metal operations including shearing and forming, design principles of press tools, center of pressure, scrap strip layout and press tonnage capacity.
- 5. Understand the design concepts of jigs, fixtures and cutting tools in manufacturing.

Unit - I

Metal Cutting : Classification of metal cutting operations, mechanics of metal cutting, tool signature, built up edge formation, mechanism of chip formation, types of chips, oblique and orthogonal cutting - Merchant's Theory of metal cutting, Merchant's force diagram, Lee and Schaffler's theory of metal cutting. Two component tool dynamometer.

Unit - II

Tool Wear and Tool Life : Sources of heat in metal cutting, heat dissipation and distribution to chip, tool and work piece, methods of evaluating temperature at tool-chip interface. Machinability, factors affecting machinability, mechanics of tool wear and various types of tool wear-crater wear and flank wear. Introduction to tool life, Taylor's tool life equation, effects of tool geometry, feed, depth of cut, cutting speed on tool life.

Unit- III

Cutting Tool Materials : Essential requirements of a tool material, tool materials - HCS, HSS, Cast alloys, Carbides, Ceramic tools, Diamond tool bits.

Essential requirements of a good cutting fluid, types of cutting fluids and their relative applications. Economics of machining - introduction, economic tool life, optimal cutting speed to maximum production.

Unit- IV

Press working

Press working terminology, press operations - punching, blanking and other types of press working operations, drawing and deep drawing, bending and forging, Design considerations for forging and bending dies.

L	T/D	Ρ	С
3	-	-	3

Press Tools : types of cutting dies and their working, design considerations for press tools-centre of pressure, scrap strip layout, press tonnage capacity, etc.

Unit - V

Jigs and Fixtures : definition, elements of jigs and fixtures, difference between jig and fixture,3-2-1 principle of location, locating devices, clamping devices Design features, principles and considerations of jigs and fixtures with examples (drill jig and milling fixture).

Unit - VI

Design of Cutting Tools: Design o single point cutting tool, elements of twist drill and its design considerations, Design of milling cutters, Broach design.

Text Books :

- 1. P. C. Sharma, Production Technology, S.Chand Publishers, New Delhi.
- 2. Amitha Ghose and Mallik , Manufacturing Science, EWP Publishers, New Delhi.
- 3. Donaldson, Tool Design, TMH Publishers, New Delhi.

Reference Books :

- 1. Roy A. Lindberg, *Processes and Materials of Manufacture*, PHI Publishers, New Delhi.
- 2. G. R. Nagpal, Tool Engineering & Design, Khanna Publishers, New Delhi.
- 3. ASTME, Fundamentals of Tool Design, PHI Publishers, New Delhi.
- 4. R.K. Jain , Production Technology, Khanna Publishers, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME313: DESIGN OF MACHINE MEMBERS – II (DMM2) (For ME -VI Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Design shafts and couplings using failure criteria.
- 2. Design helical springs and laminated springs
- 3. Design journal and antifriction bearings.
- 4. Design spur gears, helical gears, bevel gears and worm gears
- 5. Design the IC Engine parts includes connecting rod, piston, crank shaft and fly wheel.

UNIT – I

Design of Shafts : Design of solid and hollow shafts for strength and rigidity, design of shafts for combined loads.

UNIT – II

Design of Shaft Couplings : Design of sleeve or muff coupling, split muff coupling, CI flange coupling, protected type of flange coupling, rigid flange coupling, bushed pin type flexible coupling.

Unit – III

Springs: Classification of springs, design of coiled springs of various cross section, concentric springs, leaf springs, Belleville springs.

Unit – IV

Journal Bearings: Types of journal bearings, lubrication, bearing modulus, full and partial journal bearings, clearance ratio, Heat dissipation of bearings, bearing materials, journal bearing design.

Antifriction Bearings: ball and roller bearings, static load, dynamic load equivalent radial load, design and selection of ball and roller bearings.

Unit – V

Design of Spur and Helical gears: Classification of gears, design of spur gears, Lewis equation - bending strength, dynamic load and fatigue of gear tooth, Design of Helical gears. **Design of Bevel and Worm gears:** Design of bevel gears and Design of worm gears.

Unit – VI

Design of I.C Engine Parts: Design of connecting rod, design of piston for I.C engine, design of crank and crankshafts, Flywheel. Introduction to optimum design.

L	T/D	Ρ	С
3	1	-	3

Text Books :

- 1. R.K. Jain , Machine Design, Khanna Publishers, New Delhi.
- 2. V.B.Bhandari, Design of Machine Elements, TMH Publishers, New Delhi.

Reference Books:

- 1. Schaum's series, Machine Design, TMH Publishers, New Delhi.
- 2. Sadhu Singh, *Machine Design*, Khanna Publishers, New Delhi.
- 3. Joseph E. Shigely, Mechanical Engineering Design, TMH Publishers, New Delhi.
- 4. M.F. Spotts, Design of Machine Elements, PHI Publishers, New Delhi.

Data Hand Book:

1. Mahadevan and Balaveera Reddy, *Machine Design DataHand Book*, CBS Publishers, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME314: ENGINEERING METROLOGY LAB (EMT(P)) (For ME -VI Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Measure Linear, angular, circular objects using metrology equipment
- 2. Test the gear and screw thread elements using metrology equipment.
- 3. Draw the control charts for the given samples using SQC.
- 4. Evaluate standard times using work measurement technique.

LIST OF EXPERIMENTS

- 1. Measurement of Screw Threads.
- 2. Measurement of angle of Taper plug gauge.
- 3. Measurement of angle of Taper ring gauge.
- 4. Measurement of co-ordinates of Jig plate.
- 5. Measurement of angle using Sine bar.
- 6. (a) Measurement of angle of the V-block using ball and height gauges.(b) Measurement of the Radius of Curvature.
- 7. Measurement of Gears parameters.
- 8. a) To find small angles and length measurement on objects using Tool Makers micro scope.

b) To find small angles and length measurement on objects using Profile Projector

- 9. Measurement of surface roughness using surface roughness meter
- 10. Work Study- a) Method study b) Time study
- 11. Statistical Quality Control X and R charts.
- 12. Acceptance Sampling
- 13. To collect the anthropometric data using "Anthropometer".

L	T/D	Ρ	С
-	-	2	2

ME315: Database & Computational lab (DBC(P)) (For ME -VI Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

- At the end of the course students will be able to
- 1. Understand the SQL concepts.
- 2. Execute the SQL quarries and functions for retrieving and manipulation of data.
- 3. Understand the basic MATLAB operations
- 4. Solve the mathematical problems using MATLAB

Cycle-I

- 1. Introduction to Database Management System (DBMS)
- 2. Creating database object (Table),
- 3. Insertion of data, Retrieval of data
- 4. Manipulation of data and data transaction control
- 5. Set operators and joins
- 6. Arithmetic and logical operators
- 7. SQL functions
- 8. SQL formatting commands and sub queries

Cycle-II

- 1. Introduction to MAT lab and basic operations such as addition, multiplication etc.
- 2. Basic matrix operations such as matrix addition, matrix multiplication and computing determinant value of a matrix.
- 3. Random number generation
- 4. Basic MAT lab programming.

L	T/D	Ρ	С
-	-	2	2

ME 316: HEAT TRANSFER LAB (HT(P)) (For ME -VI Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Determine thermal conductivity and heat transfer coefficient through metals and powders.
- 2. Apply heat transfer concepts to interpret heat transfer rate of composite walls, fins .
- 3. Analyze the performance of heat exchangers.
- 4. Apply the radiation concepts on different heat transfer equipments.

LIST OF EXPERIMENTS

- 1. Test on Composite wall
- 2. Test on Lagged pipe
- 3. Test on lagged sphere
- 4. a) Test on emissivity apparatusb) Test on critical heat flux apparatus
- 5. Test on Stefan Boltzman Apparatus
- 6. Test on Natural convection Equipment
- 7. Test on Pin fin Apparatus
- 8. Test on Heat Exchanger
- 9. Test on Drop wise and Film Wise Condensation apparatus
- 10. Test on heat pipe apparatus
- 11. Test on unsteady state heat transfer apparatus
- 12. Performance test on refrigeration tutor
- a) Study of basic psychrometric processes on Air-conditioning Test Rig.b) Determination of COP and Bypass factor of Air-conditioning Test Rig
- 14. Test on Solar flat plate collector

L	T/D	Ρ	С
-	-	2	2

FOUR YEAR B.Tech DEGREE COURSE Scheme of instruction and Examination (Effective from 2013-14)

VII Semester (ME)

Scheme : 2013

S.		Code		Cre Scheme Instruction		of	of Duratio n of end		Scheme of Examination	
No	Subject		dits	period L	ds/wee D/T	ek P	Exam (Hours	End Exam	Intern al	Total
Ι	Theory									
1	Operations planning & Control	ME401	3	3	1	-	3	70	30	100
2	CAD/CAM	ME402	3	3	-	-	3	70	30	100
3	Finite Element Methods	ME403	3	3	1	1	3	70	30	100
4	Mechanical vibrations	ME404	3	2	1	1	3	70	30	100
5	Professional Elective – I		3	3	-	-	3	70	30	100
6	Global Elective		2	2	-	-	3	I	100	100
Π	Practical									
7	CAE Lab	ME405	2	-	-	3	3	70	30	100
8	CAM Lab	ME406	2	-	-	3	3	70	30	100
9	Project Work Preliminary	ME407	2	-	-	3	-	50	50	100
	Total		23	16	3	9	-	540	360	900

ME401: OPERATIONS PLANNING & CONTROL (OPC) (For ME -VII Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

L	T/D	Р	С
3	1	-	3

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the basic functions of Production planning control, characteristics of Job shop, Batch and continuous production systems, and procedure of product design and development.
- 2. Solve demand forecasting problems using time series, exponential smoothing, regression (simple linear) methods.
- 3. Understand the strategies of aggregate planning, relevant costs, basic inputs, outputs and logic of Materials Requirement Planning
- 4. Solve the line balancing problems using Largest candidate rule, Kilbridge and Wester's method, and Ranked Positional Weights method.
- 5. Classify inventory items into A, B and C classes and determine optimum ordering/manufacturing quantity under deterministic conditions.
- 6. Construct- averages and range charts for variable quality characteristics data, fraction defective and count of defectives charts for attributes quality characteristics data, and OC curve for single sampling plans.

Unit – I

Introduction: Definition, functions of PPC, Types of production -job, batch and continuous production, Product design and development, standardization, simplification, specialization, Product life cycle.

Unit - II

Forecasting: Introduction, Forecasting Objectives and Uses, Forecasting methods – Opinion and judgmental methods, Time series method, Exponential smoothing, Regression & Correlation method.

Unit - III

Aggregate Planning & Master Scheduling: Introduction, Objectives of Aggregate Planning, Costs in aggregate planning, Strategies in aggregate planning, Master Production Scheduling.

Assembly line balancing – Methods of line balancing: Largest candidate rule, Kilbridge and Wester's method, and Ranked Positional Weights method.

Material Requirement Planning (MRP): Importance of MRP, MRP system inputs and outputs, MRP calculations.

Unit – IV

Inventory Management: Introduction, Types of Inventories, Inventory Costs.

Deterministic Inventory models: Basic EOQ model, Manufacturing model without shortages, EOQ model with planned shortages, Inventory model with price breaks, ABC analysis.

Unit - V

Quality Control : Concept of quality, evolution of quality control, assignable and chance causes of variation, Variable Control charts (\overline{X} and R charts)

Unit - VI

Attributes control charts (P chart and C chart),

Acceptance Sampling – Single Sampling, Double Sampling and Multi sampling plans – OC curves of single sampling plans

Text Books :

- 1. M.Mahajan, Industrial Engineering and production management, Dhanpat rai and Co, New Delhi.
- 2. Joseph G. Monks, Operations Management, TMH Publishers, New Delhi.

Reference Books :

- 1. S.N. Chary, Operations Management, TMH Publishers, New Delhi.
- 2. N.D. Vohra, Quantitative techniques in Management, TMH publishers, New Delhi

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME402: CAD/CAM(CADM) (For ME -VII Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the need for CADCAM, 3D modeling , geometric modeling and computer graphics
- 2. Understand the wireframe models, solid and surface models, parametric representation of cubic spline, Bezier and B-spline curves, B-rep, Constructive Solid Geometry and sweep representation.
- 3. understand Numerical Control, classification of NC machines, part programming, CNC, DNC and adaptive control
- 4. Write computer assisted part programs and APT programs for machining operations.
- 5. Understand group technology, parts classification, flexible manufacturing systems, its components and layouts.
- 6. Understand material handling systems, automated guided vehicles, Computer integrated manufacturing, Computer integrated production planning systems and Computer aided process planning.

Unit - I

Fundamentals of CAD :The design process, applications of computers for design, benefits of CAD, Computer configuration for CAD application, Computer peripherals for CAD Design work station, Graphic terminal.CAD software - Definition of system software and application software. CAD database and structure.

Geometric modelling : 3- D wire frame modelling, wire frame entities and their definitions, Interpolation and approximation of curves, concept of parametric and non parametric representation of curves.

Unit – II

Curve and Surface Modelling: Generation of plane and space curves. Wire frame models and curve representation - parametric representation of curved shapes - cubic spline, Bezier, B-spline curves.Curve manipulations, Hidden line algorithms surface modelling.

Solid Modelling: Solid models and entities, solid representation, fundamentals of solid modelling, boundary representation (B-rep). Solid modellers, Constructive Solid Geometry (CSG) and sweep representation. Hidden surface algorithms, shading and colouring of surfaces, organization of solid modellers. Solid manipulations.

Unit - III

Numerical Control of Manufacturing: Numerical control (NC) definition, Classification of NC machines, Open loop, Closed loop, Absolute, Incremental system, Advantages of NC machines, Machining centre.Method of NC part programming, computer assisted programming, APT language, APT -statements, geometric statement, Motion statement,

L	T/D	Ρ	С
3	-	-	3

Post processing statement, Auxilary statements, Structure of APT programming, simple problems using APT language. CNC, DNC, Adaptive control.

Unit - IV

Group Technology : Group technology fundamentals, Part classification methods, coding systems, advantages of GT, applications of GT.

Unit – V

Flexible Manufacturing Systems (FMS) :Introduction, What is FMS, components of FMS, computer system configuration FMS layouts, FMS compared to other types of manufacturing systems, Types of FMS, benefits of FMS, applications of FMS.

Unit – VI

Automated Material Handling : Types of material handling equipment, Automated guided vehicles(AGVs), Vehicle guidance and routing; Traffic control, Benefits of AGV. Automated Storage and retrieval system.

Computer Integrated manufacturing (CIM): Computer integrated production planning systems, Computer aided process planning (CAPP)

Text Books:

- 1. M.P.Groover and E.W.Zimmers, CAD/CAM, PHI Publishers, New Delhi.
- 2. Mikell P. Groover, Automation Production Systems and Computer Integrated Manufacturing, PHI Publishers, New Delhi.
- 3. Ibrahim Zeid, CAD/CAM Theory and Practice, TMH Publishers, New Delhi.

Reference Books :

- 1. P. N. Rao "CAD/CAM principles and operations", Tata McGraw Hill
- 2. Joe Rooney and Philip, Principles of CAD, EWP Publishers, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME403 FINITE ELEMENT METHODS (FEM) (For ME -VII Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Understand basic concepts of matrices and methods of solution of simultaneous algebraic equations.
- 2. Understand step by step procedure of FEM, shape functions, selection of elements and treatment of boundary conditions.
- 3. Analyze bar structures using one dimensional element.
- 4. Solve problems related to trusses and beams using FEM.
- 5. Apply finite element method for solving the two dimensional stress analysis using CST
- 6. Solve one dimensional heat transfer and torsional problem using FEM

Unit - I

Finite Element Technique: Fundamental concepts of the Finite Element Methods, advantages and applications of FEM, steps followed in FEM, Discretization of the domain, types of elements.

Shape functions and Boundary conditions: Shape functions, element stiffness matrix, element mass matrix, applying of boundary conditions, natural coordinate systems and global coordinate systems. Formulation of finite element model and solution.

Unit - II

Analysis of Bar Structures : Axial or Bar element, stiffness matrix for bar element, problems on bar element.

Unit - III

Analysis of Truss Structures: Two-dimensional truss element, stiffness matrix for twodimensional truss, simple problems on two-dimensional truss structures.

Unit - IV

Two Dimensional Stress Analysis: Finite element modeling for two-dimensional stress analysis, element stiffness matrix for constant strain triangle (CST) and treatment of boundary conditions.

Unit - V

Analysis of Beam Structures: Beam elements, stiffness matrix for beam element, transformation matrix, simple problems on beam structures – stresses and deflection of beams – cantilever and simply supported beams.

L	T/D	Ρ	С
3	1	-	3
Unit - VI

Steady State Heat Transfer Analysis: One-dimensional analysis of a fin and wall. Analysis of a uniform shaft subjected to torsion.

Text Books:

1. Tirupati Chandrapatla and Bellagundu, Introduction to Finite Element in Engineering, Pearson Education, New Delhi.

2. S.S.Rao, Finite Element Methods, Pergamom Press, New York

3. J.N.Reddy, Introduction to FEM, TMH Publishers, New Delhi.

Reference Books:

1. David V. Hutton, Fundamentals of Finite Element Analysis, TMH Publishers, New Delhi.

2. Desai and Abel, Introduction to the Finite Element Methods, CBS Publishers, New Delhi.

3. O.P.Gupta, Finite and Boundary Methods in Engineering, Oxford and IBH Publishers, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME404: MECHANICAL VIBRATIONS (MV) (For ME -VII Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course	Outcomes:
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At the end of the course students will be able to

- 1. Understand theory of vibration, classical method and energy method to find the equation of vibrating system, viscous damping, under damping, critical damping, over damping and solve related problems.
- 2. Solve problems on one degree freedom systems with forced vibration.
- 3. Understand the concepts of motion excitation, transmissibility, isolation, seismic instruments, accelerometer ,vibrometer, and critical speed of shaft with and without damping.
- 4. Compute natural frequencies and mode shapes for two degree freedom systems.
- 5. Solve problems on multi degree freedom systems using Influence co-efficient method, Stodola method, Holzer's method and matrix iteration method.
- 6. Estimate natural frequency of transverse vibrations of simply supported beam with point load and Uniformly distributed load using Rayleigh's and Dunkerley's methods.

Unit – I

Single Degree Freedom Systems: Undamped free vibration: Classical method, Energy method, equivalent systems.

Damped Free Vibration: Viscous damping, under damping, critical damping, over damping, equivalent damping coefficient, Simple problems.

Unit – II

Single Degree Freedom Systems with Forced Vibration: Steady state forced Vibration, sources of excitation, impressed harmonic force, impressed force due to unbalance,

Support Excitation

Motion excitation, transmissibility and isolation, performance of different type of isolators. General theory of seismic instruments, accelerometer and vibrometer.

Unit – III

Two Degree Freedom Systems: Natural frequencies and modes of vibration by classical method of spring-mass system, forced vibration, dynamic vibration absorber

Unit – IV

Multi Degree Freedom Systems: Influence co-efficient method, lumped mass and distributed mass systems, Stodola method, Holzer's method, matrix iteration method, orthogonality of mode shapes.

Unit – V

Transverse Vibrations : Natural frequencies of beams- Simply supported beam with point load and uniformly distributed load. Rayleigh's and Dunkerley's methods.

L	T/D	Р	С
2	1	-	3

Torsional Vibrations : Free torsional vibrations of single rotor, free torsional vibrations of two-rotor and three-rotor system, torsionally equivalent shaft and geared systems.

Unit – VI

Vibration in Continuous Systems: Whirling of shafts, critical speed of shafts, critical speed of shafts with and without damping.

Text Book:

1. G. K. Grover Mechanical Vibrations, New Chand and Bro's Publishers, Roorkee.

2. V.P. Singh, Mechanical Vibrations, Dhanpat Rai and Sons Publishers, New Delhi.

Reference Books:

1. Thomson William T, Vibration Theory and Applications, Pearson Education, New Delhi.

2. J. S. Rao and K. Guptha, Theory and Practice of Mechanical Vibrations, WEL Publishers, New Dehi

3. Timoshenko SP and Young DH, Introductory Course on Vibration Problems in Engineering, John Wiley and Sons Publishers, Singapore.

4. Singrasu S. Rao, Mechanical Vibrations, Pearson Education, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME405: CAE LAB (CAEP) (For ME -VII Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Understand basic features of ANSYS
- 2. Analyze the stresses in beams, trusses and plate using ANSYS
- 3. Analyze heat transfer on plates using ANSYS

List of experiments using ANSYS

- 1. Introduction to ANSYS software
- 2. Analysis of 2D Truss
- 3. Analysis of plate with a hole subjected to tensile load
- 4. Analysis of flat rectangular plate with a hole under axi-symmetric conditions
- 5. Analysis of a bracket
- 6. Stress and deflection Analysis of cantilever beams
- 7. Stress analysis of simply supported beams
- 8. Analysis of bars with different materials
- 9. Analysis of taper bar
- 10. Coupled structural and thermal analysis
- 11.Exercise on simple conduction
- 12. Analysis of square plate considering conduction and convection
- 13. Model analysis of beams

L	T/D	Ρ	С
-	-	3	2

ME406: CAM LAB (CAMP) (For ME -VII Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Simulate components in ESPIRIT CAM, MASTER CAM and CNC TUTOR.
- 2. Write and execute CNC part programs using G and M codes and manufacture prototypes on CNC machines.
- 3. Produce simple components on 3D printer.

LIST OF EXPERIMENTS

- 1. CNC Part Programming on ESPIRIT CAM LATHE.
- 2. CNC Part Programming on ESPIRIT CAM MILLING.
- 3. CNC Part Programming on MASTER CAM LATHE.
- 4. CNC Part Programming on MASTER CAM MILLING.
- 5. Producing Work piece on HITECH CNC LATHE(Step Turning)
- 6. Producing Work piece on HITECH CNC LATHE (Taper Turning).
- 7. Producing Work piece on HITECH CNC LATHE (Radius turning)
- 8. Producing Work piece on HITECH CNC MILLING (Model-1)
- 9. Producing Work piece on HITECH CNC MILLING (Model-2)
- 10. Producing a simple model using 3D Printing.

L	T/D	Ρ	С
-	-	3	2

ME407: PROJECT WORK PRELIMINARY (For ME -VII Semester)

Scheme: 2013Internal Assessment: 50End Exam: 50End Exam Duration: 3 Hrs

Course O	Jutcomes:
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At the end of the course students will be able to

- CO1. Solve real world problems through following standard design and development procedures.
- CO2. Identify technical ideas, strategies and methodologies.
- **CO3**. Utilize modern tools, algorithms, techniques that contribute to obtain the solution of the project problem.
- **CO4.** Develop prototype, perform tests to validate the prototype and analyse the cost and effectiveness.
- **CO5**. Explain the acquired knowledge through preparation of report and oral presentations.

L	T/D	Ρ	С
-	-	3	2

FOUR YEAR B.Tech DEGREE COURSE Scheme of instruction and Examination (Effective from 2013-14)

V	'III Semester (ME)							Schen	ne: 2013	
s.	Subiect	Code credits		Scheme of Instruction		Duration	Scheme of Examination			
No				L	D/T	P	of end	End Exam	Internal Assessmen	Total
	Theory									
1	Industrial Robotics	ME408	3	3	-	-	3	70	30	100
2	Automobile Engineering	ME409	3	3	-	-	3	70	30	100
3	Professional Elective – II		3	3	-	-	3	70	30	100
4	Professional Elective – III		3	3	-	-	3	70	30	100
	Practical									
	Dynamics &	ME410	2	-	-	3	3	70	30	100
5	Instrumentation Lab									
6	Project Work	ME411	6	-	-	6	3	50	50	100
	Total		20	12	-	9		400	200	600

ME408: INDUSTRIAL ROBOTICS (IRT) (For ME -VIII Semester)

Scheme : 2013

Internal Assessment : 30End Exam: 70End Exam Duration : 3 Hrs

L	T/D	Ρ	С
3	-	-	3

Course Outcomes:

At the end of the course students will be able to

- 1. Understand robots anatomy & robot technology.
- 2. Understand end effectors, sensors, robot motion control, homogeneous transformations and solve related problems.
- 3. Understand robot programming methods including lead through and textual languages and robot language structures.
- 4. Understand types of robot work cells including robot centered cell, inline and mobile robot cell, work cell control, graphical simulation of work cell and economic analysis.
- 5. Understand robot applications in manufacturing and processing operations.

Unit – I

Fundamentals of Robotics and Robot technology: Automation and robotics, robot definition, robot anatomy, robot configurations, work volume, precession of movement, robot actuation and feed back component, actuators, hydraulic actuators, electrical actuators (variable reluctance type and permanent magnet type stepper motor). Position sensors (potentiometer, resolvers, and encoders), velocity sensors (tachometer), power transmission devices.

Unit - II

End Effectors and Sensors : Robot end effectors, types of end effectors, mechanical grippers, other type of grippers, Hooks, Scoops and other miscellaneous devices, sensors in robotics tactile sensors, proximity and range sensors, Machine Vision, use of sensors in robotics.

UNIT - III

Robot Motion Analysis and Control: Introduction to manipulator kinematics, position representation, forward transformation and reverse transformation of two degree freedom robot arm, three degree of freedom arm in two dimensions, four degree freedom manipulators in three dimension, homogeneous transformation and homogeneous transformation matrix.

Unit - IV

Robot Programming Languages : Methods of robot programming, WAIT, SIGNAL and delay commands; The textual robot programming languages, robot language structures, constants, variables and other data objects, motion commands, end effectors and sensors commands, computations and operations, program control and subroutines, monitor mode commands.

Unit –V

Robot Work Cell: Robot cell design and control- robot cell layout, work cell control, interlocks, error detection and recovery, graphical simulation of robot work cell.

Economic analysis for robotics: Basic data required for economic analysis, methods of economic analysis.

Unit – VI

Robot Applications in Manufacturing: Material transfer and machine loading and unloading-general considerations in material handling.

Processing Operations: Spot welding, continuous arc welding, spray coating, and other processing operations.

Text Books :

1. Robert J Schilling, Fundamentals of Robotics Analysis and Control, Pearson Publishers, New Delhi.

2. Mickel. P.Groover and Mitcheel Seisstel, Industrial Robotics – Technology, Programming and Applications, McGraw Hill Publishers, New Delhi.

Reference Books :

1. Deb S.R., Robotics Technology and Flexible Automation, TMH Publishers, New Delhi

2. Janaki Raman P.A., Fundamentals of Robotics and Image Processing an Introduction, TMH Publishers, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME409: AUTOMOBILE ENGINEERING(AME) (For ME -VIII Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Understand the use and operation of cylinder block, cylinder liners, piston, connecting rod, crank shaft, cam shaft, air cleaners, exhaust intake manifolds and mufflers.
- 2. Understand the working of cooling system, lubrication system and fuel supply system of SI and CI engines of an automobile.
- 3. Understand the working of electronic ignition system for automobiles and components like battery, dynamo, alternator, cutout, current regulator, voltage regulator, starting motor and sparkplug.
- 4. Understand the working of manual transmission system, differential gear box, steering geometry and axles of an automobile
- 5. Understand the working of front axle suspension, rear axle suspension and air suspension systems of an automobile.
- 6. Understand the working of mechanical braking, hydraulic braking, pneumatic braking systems and emission standards of an automobile

Unit- I

Engine Parts : Function and constructional details of Cylinder block, Cylinder liners - wet and dry types, Piston, Connecting rods, Crank shaft, Cam shaft, Air cleaner, Intake and Exhaust manifolds, Mufflers.

Cooling System : Need for cooling of automobile-Types of cooling-air cooling, water-cooling. Natural circulation (Thermo-syphon system), Forced circulation and sealed Systems. Components of water-cooling system. Water pump, fan, Radiator, Thermostats and temperature indicators. Anti-freeze mixtures.

Unit - II

Fuel Supply Systems : Fuel supply system of diesel engine, fuel injection pumps, Super charging of diesel engines. Fuel supply system for petrol engines- Carburetors, Air- fuel ratios at different vehicle running conditions, Working of a simple carburetor. Various carburetor systems- Float, Starting, Idle, Low speed, High speed and acceleration systems. MPFI and EFI systems.

Types of carburetors - Working and constructional details of SU, Zenith and Carter carburetors. **Unit- III**

Lubricating Systems : Need for lubrication - Functions of lubricating oil. Properties of lubricating oil, and S.A.E grading of lubricants. Lubricating systems - Petroil. Splash, Pressure feed, Wet and Dry sump, Semi pressure and-pre-lubrication system-Components of lubricating system- oil pumps, Oil filters,

Unit -IV

L	T/D	Ρ	С
3	-	-	3

Ignition -System: Electronic ignition systems. Storage battery, Battery rating, Dynamo, Alternators, Cutouts, Voltage and Current regulators. Starting motors. Spark plugs-Hot and Cold, Computer controlled coil ignition sensors.

Unit - V

Transmission System: Clutch-Principle and requirements of a clutch, types s of clutches - Single plate, Multi plate and Centrifugal, Semi-centrifugal clutches.

Gearbox -Requirements of a gearbox, Gear selecting mechanism, Types of gear boxes-Sliding mesh, Constant mesh and Synchro mesh. propeller shaft Functions and constructional details,

Differential : Principle of working and it's construction, Front axle-stub axle-types of stub axles.

Rear axle-Semi floating. Three-quarter floating and Full floating axles. Steering- Wheel alignment. Steering geometry-Camber-Castor, Kingpin inclination, Toe in, and Toe -out. Steering linkages-Under steering and over steering. Power steering

Unit - VI

Suspension : Types of suspension springs, Front axle independent sus- pension systems-Wish bone type. Trailing link type, Vertical link type. Rear axle suspension systems, Shock absorbers, Air suspension system.

Brakes : Requirements of good braking system. Types of brakes-Mechanical, Hydraulic and pneumatic systems Emission control, environ- mental effects on engines, Euro Standards I & II. Introduction to concept of Mechatronics

Text Books :

1. Kirpal Singh, Automobile Engineering Vol. 1&2, Standard Publishers, New Delhi.

2.R.B Gupta, Automobile Engineering, Satya Prakasam Pub lishers, New Delhi.

Reference Books :

1.W.H.Crowse, Automotive Mechanics, TMH Publishers, New Delhi.

2. Joseph Heitner, Automotive Mechanics, EWP Publishers, New Delhi.

3.Heldt, High Speed Combustion Engines, Oxford and IBH Publishers, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME410: DYNAMICS & INSTRUMENTATION LAB (DIN(P)) (For ME -VIII Semester)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- 1. Balance rotating masses in different planes.
- 2. Measure the critical speed of the shaft with fixed end conditions.
- 3. Measure vibration characteristics of spring mass system, rotor system and damped system.
- 4. Measure pressure, displacement and temperature using instrumentation tutors.

LIST OF EXPERIMENTS

DYNAMICS

- 1. Determination of Radius of Gyration of Connecting Rod
- 2. Longitudinal Vibrations of Spring-Mass System.
- 3. Experiment on Governors
- 4. Static and Dynamic balancing of rotating masses and reciprocating masses
- 5. Velocity & Acceleration of Cam & Follower
- 6. Test on Gyroscope
- 7. Study of Damped and Undamped Torsional Vibration
- 8. Torsional Vibration of Single and Two Rotor System
- 9. Verification of Dunkerly's Rule
- 10. Critical speed or Whirling speed of shaft

INSTRUMENTATION

- 1. Test on Instrumentation Tutors
- 2. Calibration of Dead Weight Presser Gauge.
- 3. Study of simple control systems
- 4. Calibration of rotameter

L	T/D	Ρ	С
-	-	3	2

ME411: PROJECT WORK (For ME -VIII Semester)

Scheme: 2013Internal Assessment: 50End Exam: 50End Exam Duration: 3 Hrs

Course Outcomes:

At the end of the course students will be able to

- CO1. Solve real world problems through following standard design and development procedures.
- CO2. Identify technical ideas, strategies and methodologies.
- **CO3**. Utilize modern tools, algorithms, techniques that contribute to obtain the solution of the project problem.
- **CO4.** Develop prototype, perform tests to validate the prototype and analyse the cost and effectiveness.
- **CO5**. Explain the acquired knowledge through preparation of report and oral presentations.

L	T/D	Ρ	C
-	-	3	6

List Of Professional Electives-I

- 1. ME412: ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS (AIES)
- 2. ME413:QUALITY & RELIABILITY ENGINEERING (QRE)
- 3. ME414:OBJECT ORIENTED PROGRAMMING THROUGH C++ (OOPC)
- 4. ME415:PRODUCTIVITY MANAGEMENT (PM)
- 5. ME416:OPTIMIZATION METHODS (OM)

ME412:ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS (AIES)

(Elective-I)

Scheme : 2013

Internal Assessment : 30

End Exam : 70

End Exam Duration : 3 Hrs

Course outcomes:

At the end of the course students will be able to

- Understand the concept of Artificial intelligence.
- Understand the concept of Solution Searching for engineering problems
- Understand the system architecture of intelligent manufacturing
- Solve Process Planning and machining Optimization using machine learning and Neural networks

Unit – I

Introduction : Artificial intelligence : AI problems, foundation of AI and history of AI agents, agents and environment, the concept of rationality, the nature of environment, structure of agents, problem solving agents, problem formulation.

Unit – II

Searching : The underlying assumptions, The level of the model, Criteria for success, searching for solutions ,uniform search strategies-Heuristic Search Techniques, Generate and test, hill climbing, Breadth first search, problem Reduction, Constraint Satisfaction, means-ends analysis.

Unit - III

Knowledge Representation: Representations and mappings, approaches to knowledge representation, issues in knowledge representation, the frame problem.

Representing Knowledge using rules: Procedural verses declarative knowledge, logic programming, Forward verses backward reasoning, matching, control Knowledge.

Unit - IV

Intelligent manufacturing: System components, system architecture and data flow, system operation,

Unit –V

Components of know ledge based systems: First order logic, production rules, structured production rules, frames, Inference engine, Knowledge acquisition.

L	T/D	Ρ	С
3	-	-	3

Knowledge based systems for FMS: Knowledge based system for group Technology, Knowledge based systems for machine layout, Knowledge based system for scheduling.

Unit - VI

Machine Learning: Conceptual learning, learning and Neural net works.

Process Planning, Phases of process planning, Volume decomposition, Selection of alternative machines, tools, Fixtures, Matching optimization.

Text Books:

- 1. Elaine Rich, Kevin Knight, Artificial Intelligence, TMH Publishers, New Delhi.
- 2. Andrew Kusaik, Intelligent Manufacturing Systems, Prentice Hall Publishers, New Delhi.

Reference Books:

1. Stuart Russell, Peter Norvig, Artificial Intelligence A Modern Approach, Pearson Education, New Delhi.

2. Jackson .P, Expert Systems, Pearson Education, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME413: QUALITY & RELIABILITY ENGINEERING (QRE)

(Elective-I)

Scheme: 2013Internal Assessment: 30End Exam: 70

End Exam Duration : 3 Hrs

L	T/D	Ρ	С
3	-	-	3

Course outcomes:

The student will be able to:

- 1. Understand concepts of Total quality management.
- 2. Understand concepts of customer satisfaction and employee involvement.
- 3. Apply continuous process improvement, supplier partnership and TQM tools and technique to manufacturing engineering.
- 4. Understand concept of Benchmarking, QFD and TPM
- **5.** Estivate the reliability of components and systems using concepts of Reliability Engineering, MTTF and redundancy techniques

Unit – I

Introduction to T.Q.M : Introduction to Quality; Evolution of and basic approach to Total Quality Management; Leadership concepts; The Seven habits of highly effective people; Role of TQM Leaders; Implementation of TQM; Quality council, core values and concepts, quality statements; strategic planning and communications.

UNIT - II

Customer Satisfaction: Types of Customers-Internal and External; Customer perception of quality; Feedback & brief discussion on Information Collecting Tools.

Employee Involvement: Maslow's hierarchy of needs; Employee Empowerment; Types of Teams, Stages of team development, Common barriers to team progress, Training; Recognition & Reward; Performance Appraisal; Benefits of Employee Involvement.

UNIT - III

Continuous Process Improvement: Introduction; Juron trilogy; Improvement strategies; P-D-S-A cycle & Problem solving method; Basic concepts of Kaizen and Six sigma quality control, Taguchi methods, Quality circles

Supplier Partnership: Introduction, Partnering, Sourcing, Supplier Selection, Supplier Rating, Relationship Development.

Tools & Techniques of TQM : Pareto diagram, Cause & Effect diagram.

UNIT - IV

Benchmarking: Introduction, Benchmarking process.

Quality Function Deployment: Benefits of QFD, House of Quality.

Total Productive Maintenance: Introduction, Seven steps to TPM.

Unit - V

Reliability Engineering: Introduction, Failures & failure modes, Causes of failures & Unreliability, Reliability Literature.

Design for Reliability: Designing for higher Reliability, Reliability & Cost.

Component Reliability: MTTF, Time dependent hazard models.

UNIT - VI

System Reliability: Systems with components- in Series, and in Parallel; Non-Series-Parallel systems.

Redundancy Techniques: Introduction, Component & Unit Redundancy, Weakest link technique.

Text Books:

- 1. Dale H. Besterfield, Total Quality Management, Pearson Education, New Delhi.
- 2. E. Balagurusamy, Reliability Engineering, TMH Publishers, New Delhi.
- 3. M.Mahajan, Statistical Quality Control, Dhanapat Rai and Sons Publishers, New Delhi.

Reference Books :

- 1. Douglas C. Montgomery, Introduction to Quality Control, John Wiley and Sons Publishers, New York.
- 2. N. Logothetis, Managing for Total Quality, From Deming to Taguchi, PHI Publishers, New Delhi.
- 3. L.S. Srinath, Reliability Engineering, East West Press, New Delhi.

Note:

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME414:OBJECT ORIENTED PROGRAMMING THROUGH C++ (OOPC)

(Elective-I)

Scheme : 2013

Internal Assessment : 30

End Exam : 70

End Exam Duration : 3 Hrs

L	T/D	Р	С
3	-	-	3

Course outcomes:

At the end of the course the student will be able to

- Understand the basic concepts of Object Oriented Programming
- Design & develop applications using Object Oriented Programming Concepts.
- Solve real world problems by using features of object oriented programming
- Understand concepts of Data Structures

Unit – I

Principles of Object Oriented programming : A look at Procedure Oriented Programming, Object Oriented Programming Paradigm, Basic Concepts of OOP, Benefits of OOP, Object Oriented Languages.

C++ : A Simple C++ Program, An example with Class, Structure of C++ Program

Unit – II

Tokens, Expressions and Control Structures : Tokens, Keywords, Identifiers and Constants, Basic Data Types, User- Defined Data Types, Derived Data Types, Dynamic Initialization of Variables.

Unit – III

Operators in C++: Scope Resolution Operator, Member Dereferencing Operators, Expressions and their Types, Implicit Conversions, Operator Precedence and Control Structures.

Functions in C++: The Main Function, Function Prototyping, Inline Functions, Function Overloading, Friend and Virtual Function.

Classes and Objects: Specifying a Class, Defining Member Functions.

Unit – IV

Constructors and Destructors: Constructors, Parameterized Constructors, Multiple Constructors in a Class, Constructors with Default Arguments, Dynamic Initialization of Objects, Copy Constructor, Dynamic Constructors, Destructors.

Operator Over loading: Defining Operator Overloading, Overloading Unary Operators and Binary Operators, Overloading Binary Operators using Friends, Rules for Overloading Operators.

Unit – V

Inheritance: Defining Derived Classes, Single Inheritance, Multi Level Inheritance, Multiple Inheritance, Hierarchical Inheritance, Hybrid In- heritance, Abstract Classes.

Unit – VI

Introduction to data structures : Types of Data Structures: Arrays, Single Linked List, Double Linked List, Operations on Linked List, Stacks, Operations and Applications on Stacks, Queues, Circular Queues, Operations on Queues and Circular Queues, Linear Search and Binary Search.

Text Books :

- 1. E.Balaguruswamy, Object Oriented Programming with C++, TMH Publishers, New Delhi.
- 2. M.P. Bhave and S.A. Patekar, Object Oriented Program ming with C++, Pearson Education, New Delhi.

Reference Books :

- 1. Herbert Schildt, The Complete Reference of C++, TMH Publishers, New Delhi.
- 2. Jean Paul Tremblay and Paul G. Soreason, An Introduction to Data Structures with Applications, TMH Publishers, New Delhi.
- 3. Mark Allen Weiss, Data structures and Algorithm Analysis, The Benjamin Cummins Inc., New York .

4. Robert Lafore, Object Oriented Programming in TurboC++, Galgotia Publishers, New Delhi

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME415: PRODUCTIVITY MANAGEMENT (PM) (Elective-I)

Scheme : 2013

Internal Assessment : 30

End Exam : 70

End Exam Duration : 3 Hrs

L	T/D	Ρ	C
3	-	-	3

Course outcomes:

At the end of the course Student will be able to

- Understand the definition of productivity and its relation with economics metrics including Inflation, standard of living.
- Understand Measurement of productivity in manufacturing and service sectors.
- Understand the procedure of implementing the Total Productivity Model.
- Understand the short and long term productivity planning models
- Understand the productivity improvement process

Unit - I

Basic Concepts of Productivity: Basic definitions of Productivity, Productivity vs. Inflation, vs Standard of Living, vs. Political Power, vs. Economic power. Factors affecting productivity, Productivity Benefit Model, Production cycle & Definition and scope of Productivity Engineering and Management.

Unit - II

Productivity Measurement1: Productivity measurement at the industrial level: Productivity Measurement in industry in general, Productivity Measurement in Manufacturing Industry,

Productivity Measurement2: Productivity Measurement in Service Industry & Productivity Measurement in Federal Government Agencies. Benefits, approaches, problems in measurement, limitations, inter - industry comparisons.

Unit - III

Total Productivity Model (TPM): Basic model, computations in the application of the model & Steps in implementing the TPM

Unit - IV

Productivity Planning Models : Short term productivity models - Weighted partial productivity model - productivity evaluation tree model - linear trend model using double exponential smoothing - comparative productivity evaluation tree model, seasonal variation model using Winter's method.

Productivity Planning Models: Long **Term Productivity Planning Models**: Total productivity - Maximization model & Total Productivity - Profit model. **Unit - V**

Productivity Improvement: Causes of productivity decline in companies & Productivity improvement techniques - Technology based Materials based, Employee based & Product task based.

Unit - VI

Productivity Improvement Programme: Formal productivity improvement - organisation structure for productivity programme - planning aspects, human aspects, implementation schedule, evaluation of the effectiveness of the formal productivity programme, problems encountered and the ways to counter them

Text Book :

1. David J. Sumanth, Productivity Engineering and Management, McGraw Hill Publishers, Singapore.

Reference Book:

1. Prem Vrat, Productivity Management- A Systems Approach, Narosa Publications, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME416: OPTIMIZATION METHODS (OM) (Elective-I)

Scheme : 2013

Internal Assessment : 30 End Exam : 70

End Exam Duration : 3 Hrs

L	T/D	Ρ	С
3	-	-	3

Course outcomes:

Students get exposure in

- Solve linear programming problems for integer solutions using Gomory's Cutting Plane method and Branch and Bound method
- Understand process of decision making under conditions of certainty and risk
- Understand process of decision making under conditions of uncertainty.
- Understand Bellman's principle of optimality to solve linear programming problems and capital budgeting problems.
- Solve unconstrained non-linear optimization problems
- Solve constrained non-linear optimization problems using Lagrangian method and Kuhn-tucker conditions.

Unit - I

Integer Programming-1: Introduction, Types of Integer Programming Problems, Gomory's Cutting Plane method.

Integer Programming -2: Branch and Bound method for all Integer Programming Problems & Mixed Integer Programming Problems

Unit - II

Decision Theory : Introduction, Decision, Decision Making & Decision Theory, Types of Decisions, decision making process, Types of Decision making Environment:

Decision making under certainty –Expected Monetary Value(EMV), Expected Opportunity Loss (EOL) Criterion & Expected Value of Perfect Information(EVPI) Criterion

Decision making under risk- Criterion of Pessimism or Manimax, Criterion of Optimism or Maximin, Minimax Regret Criterion, Criterion of Realism & Criterion of Rationality **Unit - III**

Decision making under uncertainty and **Decision tree analysis**: Introduction, Procedure of Constructing Decision Trees & Solution through Decision Tree Analysis.

Unit – IV

Dynamic Programming: Introduction- Bellman's principle of optimality-Application of dynamic programming to Linear programming problem and Capital budgeting problem.

Unit-V

Classical Optimization-1: Introduction; Unconstrained problems of maxima and minima, constrained problems of maxima and minima;

Unit - VI

Classical Optimization-2: Constraints in the form of equations - Lagrangian method; Constraints in the form of inequalities -Kuhn-tucker conditions.

Text Books :

- 1. S.D.Sharma, Operations Research, Kedarnath and Co. Publishers, Meerut.
- 2. A.P.Verma, Operations Research, S.K.Kataria & Sons, New Delhi.

Reference Books :

- 1. V. K. Kapoor, Operations Research, S. Chand, New Delhi.
- 2. S.S.Rao, Optimization Theory and Applications, NAI Publishers, Hyderabad.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

List Of Professional Electives-II

- 1. ME417: RENEWABLE ENERGY SOURCES (RES)
- 2. ME418: HYDRAULIC AND PNEUMATIC CONTROLS (HPC)
- 3. ME419: POWER PLANT ENGINEERING (PPE)
- 4. ME420: COMPUTATIONAL FLUID DYNAMICS (CFD)
- 5. ME421: ENERGY CONSERVATION AND MANAGEMENT (ECM)

ME417: RENEWABLE ENERGY SOURCES (RES)

(Elective-II)

Scheme :2013

Internal Assessment : 30

End Exam : 70

L	T/D	Ρ	C
3	-	-	3

End Exam Duration : 3 Hrs

Course outcomes:

At the end of the course, the student will be able

- 1. Identify sources of renewable energy and their primary applications
- 2. Solve problems associated with the solar energy
- 3. Understand the technologies involved in extraction of wind energy, biomass energy and geothermal energy
- 4. Understand the technologies involved in extraction of tidal, wave and ocean thermal energies

Unit - I

Introduction and Energy Conservation: Classification of energy sources-Importance of renewable energy sources and energy chain-Principles of energy conservation –Energy conservation opportunities

Fundamentals of Solar Energy: Extra terrestrial and terrestrial radiation- Solar constant and solar radiation geometry-Solar time and day length-Estimation of monthly average daily total radiation on horizontal surface and tilted surface-Measurements of radiation data.

Unit - II

Solar Collecting Devices : Flat plate collector- Losses associated with collector-Method of determination of top loss, side loss and bottom loss coefficient -Performance parameters affecting the collector performance-Efficiency of flat plate collector-selective surfaces- Air collectors- Classification of concentrating collector-Tracking of CPC collector

Solar Thermal Systems: Methods of storing solar energy-Solar water heating-Solar refrigeration system – Solar thermal power generation-Solar distillation-Solar space heating

Solar Voltaic Systems & Emerging Technology: Basic principle of PV cell-Arrangements of PV cell-classification of PV cell-Principle of magneto hydro dynamics-thermo electric and thermionic conversion, Introduction to Fuel cell.

Unit - IV

Wind Energy: Origin of wind-Application of wind power –Betz limit-Components of orizontal axis wind turbine-Types of blades- Classification of vertical axis turbine

Unit - V

Biomass Energy: Photosynthesis process- Biomass conversion technologies- Biogas production - Types of digester- Factors affecting the digester performance

Geothermal Energy: Types of geothermal energy resources-Energy conversion through geothermal energy resources-Environmental consideration

Unit - VI

Ocean Thermal Energy Conversion: Principle of OTEC- Anderson and Claude cycles

Tidal energy: Introduction- tidal energy conversion methods,

Wave energy : Introduction, conversion methods

Text Book:

1. B.H.Khan, Non-conventional Energy Sources, TMH Publishers, New Delhi. **Reference Books**:

- 1. G.D Rai, Non-conventional Energy Sources, Khanna Publishers, New Delhi.
- 2. S.Rao and Paulekar, Energy Technology, Khanna Publishers, New Delhi.
- 3. W.R.Murphy& G.Mckay, Energy Management, Butterworth & Co. Publishers, New Delhi.

4. B.Sreenivasa Reddy & K.Hemachandra Reddy, Thrmal data hand book, IK International Publishers, Bangaloore

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME418: HYDRAULIC AND PNEUMATIC CONTROLS (HPC) (Elective-II)

Scheme: 2013Internal Assessment: 30End Exam: 70

End Exam Duration : 3 Hrs

L	T/D	Ρ	С
3	-	-	3

Course outcomes:

The student will able to

- Understand basic hydraulic principles and pump and actuator selection criteria with pumping circuits.
- Design hydraulic circuits using Reciprocating, Quick return, Sequencing synchronizing Accumulator circuits
- Design hydraulic circuits by selecting suitable components
- Design Pneumatic circuits by selecting suitable components

Unit - I

Basic Principles: Hydraulic Principles - Hydraulic pumps - Characteristics - Pump Selection - Pumping Circuits

Hydraulic Actuators - Linear Rotary - Selection -Characteristics - Hydraulic Valves - Pressure - Flow - Direction Controls - Applications - Hydraulic Fluids-Symbols.

Unit - II

Hydraulic Circuits : Hydraulic circuits - Reciprocating - Quick return - Sequencing synchronizing - Accumulator circuits – Safety circuits - Industrial circuits –

Applications of Hydraulic Circuits: Press - Milling Machine - Planner - Fork Lift, Crane etc.

Unit - III

Design & Selection : Design of Hydraulic circuits - Selection of components.

Unit - IV

Pneumatic Systems : Pneumatic fundamentals - Control Elements - Logic Circuits - Position -Pressure Sensing - Switching – Electro Pneumatic - Electro Hydraulic Circuits - Robotic Circuits.

Unit - V

Design & Selection : Design of Pneumatic circuits - Classic-Cascade-Step counter -Combination -Methods - PLC-Microprocessors - Uses - Selection criteria for Pneumatic components

Unit - VI

Installation and Maintenance of Hydraulic and Pneumatic power packs - Fault finding - Principles of Low Cost Automation - Case studies

Text Books :

1. J.Michael, Pinches and John G.Ashby, Power Hydraulics, Prentice Hall Publishers, New York.

2. Andrew Parr, Hydraulics and Pnematics (HB), Jaico Publishing House, New Delhi.

Reference Books :

1. Dudleyt, A. Pease and John J. Pippenger, Basic Fluid Power, Prentice Hall Publishers, New York.

2. Anthony Esposite, Fluid Power with Applications, Prentice Hall Publishers, New York.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME419: POWER PLANT ENGINEERING (PPE) (Elective-II)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

L	T/D	Ρ	С
3	-	-	3

Course outcomes:

At the End of the course students will be able to

- Understand the sources of energy including steam, diesel, solar, wind and geothermal along with working principle of power plants
- Understand the concept of Economics of Power Generation to solve problems fixed cost and depreciation problems
- Understand the components of steam power plant, gas turbine power plant, I.C plant, and hydroelectric power plant.
- Understand the working principles of hydroelectric and nuclear power plant

Unit – I

Sources of Energy: Introduction, different sources of energy, principal types of power plants, essential requirements of a power plant.

Fuels and Combustion: Coal, fuel oil, natural and petroleum gas, industrial wastes and byproducts, biomass, thermodynamic view, combustion reactions, calculation of weight of air required for combustion, heat of combustion.

Unit –II

Combined Cycle Power Generation: Characteristics of ideal working fluid for vapour power cycle, binary vapour cycles, concept of combined cycle plants, Gas turbine – Steam turbine (combined) power plant, advantages of combined cycle power generation.

Economics of Power Generation: Terms and definitions, load duration curves, power plant economics – construction costs, Fixed cost and depreciation, fuel cost, present worth concept, incremental heat rate, input-output curves.

Unit - III

Steam Power Plant: Introduction, classification of steam power plants, layout of a modern steam power plant, fuel handling, combustion equipment for boilers, fluidized bed combustion, advantages and disadvantages of steam power plants, efficiencies in a steam power plant – calculation of different efficiencies – simple problems.

Unit - IV

Diesel Engine Power Plant: Introduction, advantages and disadvantages of diesel power plant, applications of diesel power plant, general layout, essential components of diesel power plant, layout of a diesel engine power plant.

Unit –V

Gas Turbine Power Plant: General aspects, closed cycle and open cycle plants, applications, advantages and disadvantages of a gas turbine plant, analysis of a gas turbine plant, gas turbine fuels, performance of gas turbine plants, components of gas turbine power plant.

Unit - VI

Hydro-Electric Power Plant: Introduction, advantages and disadvantages, selection of site, essential elements of hydro-electric power plant, classification of hydro-electric power plants, calculation of available hydro power.

Nuclear Power Plant: Chemical and Nuclear reactions, Nuclear Fission, chain reaction, main components of nuclear power plant, essential components of a nuclear reactor, types of reactors, power of nuclear reactor, safety measures for nuclear power plants.

Text Book :

1. P.K Nag, Power Plant Engineering, TMH Publishers, New Delhi.

Reference Books :

1. R.K Rajput, Power Plant Engineering, Lakshmi Publications, Bangalore.

2. G.D. Rai, Power Plant Technology, Khanna Publishers, New Delhi.

3. G.R. Nagpal, Power Plant Engineering, Khanna Publishers, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME420: COMPUTATIONAL FLUID DYNAMICS (CFD) (Elective-II)

Scheme : 2013

Internal Assessment : 30

End Exam : 70

End Exam Duration : 3 Hrs

Ī	L	T/D	Ρ	С
	3	-	-	3

Course outcomes:

At the end of the course students will be able to

- Apply numerical methods for solving algebraic equations.
- Solve conduction and convection problems using finite difference method.
- Solve hyperbolic and elliptic equations and fundamentals of fluid flow modeling,
- Understand both flow physics and mathematical properties of governing Navier-Stokes equations and define proper boundary conditions for solution

Unit – I

Applied Numerical Methods: Solution of a system of simultaneous Linear Algebraic Equations, iterative schemes of Matrix Inversion, Direct Methods for Matrix inversion, Direct Methods for banded matrices.

Unit – II

Finite Difference Applications in Heat conduction and Convention: Heat conduction, steady heat conduction in a rectangular geometry,, transient heat conduction , finite difference application in convective heat transfer, closure.

Unit - III

Finite Differences, discretization, consistency, stability, and Fundamentals of fluid flow modeling :Introduction, elementary finite difference quotients, implementation aspects of finite-difference equations, consistency, explicit and implicit methods

Errors and stability analysis, introduction, first order wave equation, stability of hyperbolic and elliptic equations, fundamentals of fluid flow modeling, conservative property, the upwind scheme .

Unit – IV

Governing Equations of Fluid Flow and Heat Transfer: Introduction, conservation of mass Newton's second law of motion, expanded forms of Navier-stokes equations, conservation of energy principle, special forms of the Navier-stokes equations.

Unit - V

Steady flow, dimensionless form of Momentum and Energy equations, Stokes equation, conservative body force fields, stream function- Vorticity formulation, Boundary-layer theory, Buoyancy – Driven Convection and stability.

Unit -VI

Simple CFD Techniques, viscous flows conservation form space marching, relovation techniques, viscous flows, conservation from space marching relovation techniques, artificial viscosity, the alternating direction implicit techniques, pressure correction technique.

Computer graphic techniques used in CFD Quasi one dimensional flow through a nozzle, turbulence models, standard and high Reynolds number models and their applications.

Text Book :

1. John.Anderson, Computational Fluid Dyanamics -The basics with applications, Mc Graw Hill Publishers, New York.

Reference Books :

- 1. Suhas V, Patankar Hema, Numerical Heat Transfer and Fluid Flow, Shava Publishers and Mc Graw Hill, New Delhi .
- 2. Muralidharan, Computational Fluid Flow and Heat Transfer, Nasora Publications, New Delhi

3. Tapan K. Sengupta, Fundamentals of Computational Fluid Dynamics, Universities Press, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME421: ENERGY CONSERVATION AND MANAGEMENT (ECM)

(Elective-II)

Scheme : 2013

Internal Assessment : 30

End Exam : 70

L	T/D	Ρ	C
3	-	-	3

End Exam Duration : 3 Hrs

Course outcomes:

At the end of the course students will be able to

- Understand various technologies of energy conservation.
- Understand the concepts of engineering economics
- Understand the concepts of project management including Pay back method, Net present value method and budgets.
- Understand the concept of energy auditing and energy management programs.

Unit - I

Introduction to Energy Conservation and Management: Power scenario in India and world-Rules for energy conservation- Technologies for energy conservation-Energy conservation patterns.

Cogeneration: Principle of Co generation-topping cycle and bottoming cycle, Amount of energy saving through cogeneration

Unit - II

Thermal Insulation and Refractors: Heat loss through uninsulated surfaces – Effect of insulation on current carrying wires- Critical thickness of insulation- Classification and properties of refractories and insulators.

Unit - III

Engineering Economics: Steps in planning – Efficiency of organization- Capital budgeting-Time value of money- Cash flow Diagrams – Present worth factor-Capital recover factor- Equal annual payment methods-Nominal and effective interest rates-Discrete and continuous compounding – Equivalent between cash flows
Unit - IV

Project Management: Method of investment appraisal- Rate of return method- Pay back method- Net present value method- Types of project- Types of budgets- Purpose of project management- Roles and responsibilities of project manager.

Unit - V

Energy Auditing : Objectives- Level of responsibility- Control of energy- Use of energy-Schemes of energy conservation- Energy index and cost index-Pie charts and sankey diagrams – Load profiles – Preliminary and detailed energy audit – Energy saving potential

Unit - VI

Energy Management Programs: Necessary steps of energy management program- Concepts of energy management –General principles of energy management.

Energy management in manufacturing and process industries: Qualities and functions of energy managers – Language of energy manager – Checklist for top management.

Text Books :

- 1. W.R. Murphy and G. Mickay, Energy Management, Butterworths Publishers, New Delhi.
- 2. P.W.O. Callghan, Energy Conservation, Pergmon Press, New York.

Reference Books :

- 1. D.A. Reay, Waster Heat Recovery Systems, Pergmon Press, New York.
- 2. Albert Thumann , Hand Book of Energy Audits, Prentice Hall, New Jersey.
- 3. Craig B. Smith, Energy Management Principles, Pergmon Press, New York.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions

List Of Professional Electives-III

- 1 ME422: ADVANCED PRODUCTION METHODS (APM)
- 2 ME423:EXPERIMANTAL STRESS ANALYSIS (ESA)
- 3 ME424: INTRODUCTION TO AIRCRAFT INDUSTRY AND AIRCRAFT SYSTEMS(IAIAS)
- 4 ME425: MICRO ELECTRO MECHANICAL SYSTEMS (MEMS)
- 5 ME426:NANOTECHNOLOGY(NANOT)

ME422: ADVANCED PRODUCTION METHODS (APM)

(Elective-III)

Scheme : 2013

Internal Assessment : 30

End Exam : 70

End Exam Duration : 3 Hrs

L	T/D	Ρ	С
3	-	-	3

Course outcome:

At the end of the course students will be able to

- Understand the special moulding processes including Carbon dioxide process, Ferro silicon process, Shell molding, Investment casting, Plaster molding, Full mould casting and their applications.
- Understand the foundry mechanization and modernization, and relevant equipment including sand conditioners, sand reclamation and jolt squeeze machines.
- Understand modern welding techniques, design of welding subjected to combined stresses and solve related problems.
- Understand powder metallurgy concept, steps involved in the process, applications, advantages, limitations and post processing techniques including impregnation, infiltration and machining.
- Understand the rapid prototyping technique, its history, applications and types including stereo lithography, selective laser sintering, fused deposition modelling, solid ground curing, 3D printing, their comparative merits, demerits and applications.

Unit -I

Special moulding processes : Carbon dioxide process, Ferro silicon process, Shell molding, Investment casting, Plaster molding, Full mould casting.

Unit – II

Modernization and Mechanization of Foundry, Need for Modernization and Mechanization of Foundry, Description of various equipments such as Sand conditioners.

Unit – III

Modern Welding techniques: Plasma arc Welding, Explosion Welding, SAW, Electro slag welding, Electron beam and Laser beam Welding, Forge welding.

Unit – IV

Welding Design – Principles of sound welding design, Welding joint design, Types of welding joints and their characteristics, Variables affecting the strength of welded joint, Design of welds subjected to combined stresses, Mathematical problems.

Unit – V

Powder Metallurgy : Introduction, advantages and limitations of powder metallurgy, preparation of metal powders, mixing, die and isostatic compacting methods, sintering, stages of sintering and methods, sintering furnaces, classification and sintering atmosphere, applications of power metallurgy, heat treatment of power metallurgy parts, surface treatment, impregnation treatment, machining of sintering parts.

Unit – VI

Rapid Prototyping : Need for the compression in product development History of RP systems, Survey of applications, Growth of RP industry, classification of RP systems. Brief Introduction of RP systems, Stereolithography systems, Selective Laser Sintering, Fusion Deposition Modeling, Solid ground curing.

Text Books:

- 1. P. N. Rao, Manufacturing technology: Foundry, Forming and Welding, TMH Publishers, New Delhi.
- 2. S.C. Gupta and R. K. Jain , Production technology, Khanna Publication, New Delhi.

Reference Books:

- 1. H.F.Taylor, Foundry Engineering, Wiley Eastern Publishers, New Delhi.
- 2. Heine and Rosenthal, Principles of Metal Casting, TMH Publishers, New Delhi.
- 3. Dr. R.S.Parmar, Welding Processes and Technology, Khanna Publishers, New Delhi.
- 4. Paul. F. Jacobs , Stereo Lithography and other RP & M Technologies, ASME Press, New York
- 5. P.C.Sharma, Production Engineering, S. Chand Publishers, New Delhi.
- 6. P. L. Jain , Principles of Foundry Technology, TMH Publishers, New Delhi.
- 7. R. Little, Welding And Welding Technology, TMH Publishers, New Delhi.
- 8. O.P. Khanna, Text Book of Welding Technology, Dhanpat Rai & Sons, New Delhi.
- 9. D.T. Pham and S.S. Dimov, Rapid Manufacturing, Springer Publishers, London.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

ME423: EXPERIMANTAL STRESS ANALYSIS (ESA) (Elective-III)

Scheme: 2013Internal Assessment: 30End Exam: 70End Exam Duration: 3 Hrs

L	T/D	Р	С
3	-	-	3

Course outcome:

At the end of the course students will be able to

CO1: Understand concepts of theory of elasticity, compatibility conditions, 3D stress strain relations, plane stress, plane stain conditions and its related problems.

CO2: Understand the principles of mechanical, optical, pneumatic, acoustic, electrical resistance and semiconductor strain gauges for strain measurement

CO3: Understand basic principle of photo elasticity, crystal optics and phase diagrams

CO4: Understand principles of stress optic law, plane Polaris cope, circular polar scope, dark and bright field arrangements, and isoclinic and isochromatic fringe order for obtaining principle stresses at a point.

CO5: Analyze coating stress, crack detection, and crack propagation test data using brittle coating and bi-refringent Coating technique.

CO6: Analyze the in plane, out of plane displacement fields and slope measurements using Moire-Fringes method.

Unit - I

Introduction: Theory of Elasticity, Plane stress and plane strain conditions, Compatibility conditions. Problems using plane stress and plane strain conditions, Three-dimensional stress strain relations.

Unit - II

Strain Measurement: Introduction- mechanical, optical, pneumatic, acoustic methods of strain measurement. Electrical resistance strain gauges - gauge factor, types, properties of a gauge

material, backing material, adhesive material, protective coatings; method of bonding strain gauges, strain gauges lead wire and connections, semiconductor strain gauges.

Unit - III

Photo Elasticity : Nature of light-harmonic wave, phase amplitude, polarisation. Crystal opticspassage of light through crystalline media, absolute and relative phase difference, quarter wave plate, half wave plate, production of plane polarized light.

Unit -IV

Two-dimensional photo elasticity: stress optic law, plane Polaris cope, is chromatics and isoclinic, circular polariscope, dark fields and bright field arrangements, isoclinic and isochromatic fringe order at a point.

Unit - V

Bi-refringent Coatings: Introduction to Bi-refringent coating theory and Reflection Polariscope. Moire techniques phenomenon, Moir fringe analysis, Moire techniques for in plane problems.

Brittle coatings: Introduction, coating stresses, failure theories, brittle coating crack patterns, crack detection, ceramic based brittle coatings, resin based brittle coatings, test procedures for brittle coatings analysis, calibration procedures, analysis of brittle coating data.

Unit - VI

Moire Methods: Introduction, mechanism of formation of Moire fringes, the geometrical approach to Moire-Fringe analysis, the displacement field approach to Moire-Fringe analysis, out of plane displacement measurements, out of plane slope measurements, sharpening and multiplication of Moire-Fringes, experimental procedure and techniques.

Text Books :

- 1. L.S. Srinath, M.R. Raghavan, K. Lingaiah, G. Gargesh, K. Ramachandra and B. Pant, Experimental Stress Analysis, TMH Publications, New Delhi.
- 2. Dally and Riley, Experimental Stress Analysis, McGraw Hill Publishers, New York.

Reference Books :

- 1. Durelli Philips and Tsao, Theoretical and Applied Stress Analysis, McGraw Hill Publishers, New York.
- 2. Sadhu Singh, Experimental Stress Analysis, Khanna Publishers, New Delhi.
- 3. Abdul Mubeen, Experimental Stress Analysis, Dhanpat Rai and Sons, New Delhi.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the

multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME424: INTRODUCTION TO AIRCRAFT INDUSTRY AND AIRCRAFT SYSTEMS(IAIAS)

(Elective-III)

Scheme : 2013

Internal Assessment : 30

End Exam : 70

End Exam Duration : 3 Hrs

Course outcomes:

At the end of the course students will be able to

- Understand the overall structure and operation of the aircraft industry
- understand the structural components of aircraft system, its layouts, design configurations, the advantages and disadvantages.
- understand the mechanical, electrical, electronic and hydraulic principles used in air craft systems.
- understand the fluid dynamic principles of flight and aerofoil concepts.
- understand the stability and control systems of aircraft.
- understand the performance of aircraft in terms of power, speed, altitude, forces and define maneurability

Unit - I

Aircraft industry overview: Evolution and History of Flight, Types Of Aerospace Industry, Key Players in Aerospace Industry, Aerospace Manufacturing, Industry Supply Chain, Prime contractors, Tier 1 Suppliers, Key challenges in Industry Supply Chain, OEM Supply Chain Strategies, Mergers and Acquisitions, Aerospace Industry Trends, Advances in Engineering/CAD/CAM/CAE Tools and Materials technology, Global and Indian Aircraft Scenario

Unit - II

Introduction to Aircrafts: Basic components of an Aircraft, Structural members, Aircraft Axis System, Aircraft Motions, Control surfaces and High lift Devices.

Types of Aircrafts - Lighter than Air/Heavier than Air Aircrafts Conventional Design Configurations based on Power Plant Location, Wing vertical location, intake location, Tail Unit Arrangements, Landing Gear Arrangements. Unconventional Configurations-Biplane, Variable Sweep, Canard Layout, Twin Boom Layouts, Span loaders, Blended Body Wing Layout, STOL and STOVL Aircraft, Stealth Aircraft. Advantages and disadvantages of these Configurations.

L	T/D	Ρ	С
3	-	-	3

Unit - III

Mechanical Systems: Types of Aircraft Systems. Mechanical Systems. Electrical and Electronic Systems. Auxiliary systems.

Mechanical Systems: Environmental control systems (ECS), Pneumatic systems, Hydraulic systems, Fuel systems, Landing gear systems, Engine Control Systems, Ice and rain protection systems, Cabin Pressurization and Air Conditioning Systems, Steering and Brakes Systems Auxiliary Power Unit.

Electrical systems: Avionics, Flight controls, Autopilot and Flight Management Systems, Navigation Systems, Communication, Information systems, Radar System,

Unit - IV

Basic Principles of Flight: Significance of speed of Sound, Air speed and Ground Speed, Properties of Atmosphere, Bernoulli's Equation, Forces on the airplane, Airflow over wing section, Pressure Distribution over a wing section, Generation of Lift, Drag, Pitching moments, Types of Drag, Lift curve, Drag Curve, Lift/Drag Ratio Curve, Factors affecting Lift and Drag, Center of Pressure and its effects.

Aerofoil: Aerofoil Nomenclature, Types of Aerofoil, Wing Section- Aerodynamic Center, Aspect Ratio, Effects of lift, Drag, speed, Air density on drag,

Unit - V

Stability and Control: Degree of Stability- Lateral, Longitudinal and Directional Stability and controls of Aircraft. Effects of Flaps and Slats on Lift Coefficients, Control Tabs, Stalling, Landing, Gliding Turning, Speed of Sound, Mach Numbers, Shock Waves, Mach Waves, Mach Angles, Sonic and Supersonic Flight and its effects.

Unit - VI

Aircraft Performance and Maneuvers: Power Curves, Maximum and minimum speeds of horizontal flight, Effects of Changes of Engine Power, Effects of Altitude on Power Curves, Forces acting on a Aeroplane during a Turn, Loads during a Turn, Correct and incorrect Angles of Bank, Aerobatics, Inverted Maneuvers, Maneuverability

References:

- 1. Flight without Formulae by A.C Kermode, Pearson Education,10th Edition
- 2. Mechanics of Flight by A.C Kermode, Pearson Education,5th Edition
- 3. Fundamentals Of Flight, Shevell, Pearson Education, 2nd Edition
- 4. Introduction to Flight by Dave Anderson
- **5.** Aircraft Systems: Mechanical, Electrical and Avionics Subsystems Integration by Ian moir, Allan Seabridge

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME425: MICRO ELECTRO MECHANICAL SYSTEMS (MEMS)

(Elective-III)

Scheme : 2013

Internal Assessment : 30

End Exam : 70

End Exam Duration : 3 Hrs

L	T/D	Ρ	С
3	-	-	3

Course outcomes:

At the end of the course students will be able to

- Understand working principles of Micro sensors, Micro actuators.
- Understand the concepts of system modeling and properties of materials used in micro components and devices.
- Understand the principles Mechanical, Thermal Sensors and Actuators
- Understand the concepts on MOENS, micro fluidic systems and nano technology.
- Understand the Properties of Nanotechnology Materials

UNIT- I

Introduction : Production Engineering, Precision Engineering and Ultra-Precision Engineering, Integrated Circuits (IC), Microelectro mechanical Systems (MEMS), Microsensors , Microactuators , Microelectronics Fabrication , Micromachining , MEMS classes ofproducts, Nanotechnology , Modeling and Simulation, Microinstrumentation.

UNIT-II

System Modeling and Properties of Material: The Need for Modeling, System Types, Basic Modeling Elements in Mechanical System, Electrical Systems, Fluid Systems and Thermal Systems, Translational and Rotational Pure Mechanical System with Spring, Damper and Mass, ,Modeling Hybrid Systems, Analogy between 2nd Order Mechanical and Electrical Systems, Properties of Materials, Relationship between Elastic constants

Passive Components and Systems : System-On-A-Chip (SOC) ,Passive Electronic Systems , Passive Mechanical Systems (PMS)

UNIT-III

Mechanical Sensors and Actuators : Principles of Sensing and Actuation, Beam and Cantilever, Microplates ,Capacitive Effects , Piezoelectric Material as Sensing and Actuating Elements , Strain and , Pressure Measurement, Flow Measurement using Integrated Paddle-Cantilever Structure, Pressure Measurement by Microphone, MEMS Gyroscopes, Shearmode Piezoactuator , Gripping Piezoactuator , Inchworm Technology

Thermal Sensors and Actuators: Thermal Energy Basics and Heat Transfer Processes, Thermistors, Thermodevices, Thermocouple, Micromachined Thermocouple Probe, Peltier Effect Heat Pumps, Thermal Flow Sensors, Microhotplate Gas Sensors, MEMS Thermovessels, Pyroelectricity, Shape Memory Alloys (SMA), U-Shaped Horizontal and Vertical Electrothermal Actuator, ThermallyActivated MEMSRelay, Microspring Thermal Actuator, Data Storage Cantilever

UNIT-IV

Micro-opto-electromechanical Systems : Fundamental Principle of MOEMS Technology , Review on Properties of Light , Light Modulators, Beam Splitter, Microlens , Micromirrors , Digital Micromirror Device (DMD) , Light Detectors , Grating Light Valve (GLV), Optical Switch , Waveguide and Tuning , Shear-Stress Measurement

Unit –V

Microfluidic Systems: Important Considerations on Microscale Fluid, Properties of Fluids, Analytical Expressions for Liquid Flow in a Channel ,Fluid Actuation Methods, Dielectrophoresis (DEP) , Electrowetting, Electrothermal Flow, Thermocapillary Effect ,Electroosmosis Flow, Optoelectrowetting (OEW), Tuning using Microfluidics , Typical Microfluidic Channel , Microfluid Dispenser , Microneedle Molecular Gate , Micropumps: The Continuous Flow System , Microfluidic Design Considerations

UNIT-VI

CNT and Nanotechnology : Nanotechnology Materials, Fullerenes, Carbon Nanotube (CNT), Development of CNTs, Applications of CNTs, Remarks on Properties of CNTs, Molecular Machine Components.

Simulation Based Micro and Nanosystem Design : The Need of Simulation Tool, FEM, Design Flow using Simulation Tool, Ansoft Designer and HFSS V9.0, DS/MEMS and CA/MEMS, FEMPRO, ANSYS Multiphysics, SUGAR, Atomistic to Continuum Theory, Terminology, Analytical Theory and Computational Modeling , Multiscale Concept, Multiscale Methods, Complexity of Multiscale Systems, Multiphysics- Multiengineering Integration: Important Features of CAD Tool

Text book:

1.Nitaigour Premchand. Mahalik, MEMS, Tata Mc Graw-Hill Publishing company Limited, New Delhi.

Reference books:

1.Tai-Ran Tsu, MEMS and Microsystems: Design and Manufacture,- Tata Mc Graw-Hill Company Limited, New Delhi

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

ME426: NANOTECHNOLOGY(NANOT)

(Elective-III)

Scheme : 2013 Internal Assessment : 30

End Exam : 70

End Exam Duration : 3 Hrs

L	T/D	Ρ	С
3	-	-	3

Course outcomes:

At the End of the course students will be able to

- Understand the Fundamentals of Physics of Nano materials, Preparation of Nano materials and their Characterization.
 - Understand the Mechanical, electrical, and Optical properties of nano materials.
 - Understand the working mechanism of different characterization instruments as well as analyses.
 - Understand the Importance of nanotechnology in medical diagnosis and Bio technology
 - Understand the impact of nanomaterials and their applications in nanodevices

UNIT-I

General Introduction: Basics of Quantum Mechanics, Harmonic oscillator, magnetic Phenomena, band structure in solids, Mossbauer and Spectroscopy, optical phenomena bonding in solids, Anisotropy.

Silicon Carbide: Application of Silicon carbide, nano materials preparation, Sintering of SiC, X-ray Diffraction data, electron microscopy sintering of nano particles,

Nanoparticles of Alumina and Zirconia: Nano materials preparation, Characterization, Wear materials and nanocomposites,

UNIT-II

Mechanical properties: Strength of nanocrystalline SiC, Preparation for strength measurements, Mechanical properties, Magnetic properties,

Electrical properties: Switching glasses with nanoparticles, Electronic conduction with nanoparticles

Optical properties: Optical properties, special properties and the coloured glasses

Process of synthesis of nanopowders, Electro deposition, Important nanomaterials

UNIT-III

Investigating and manipulating materials in the nanoscale: Electron microscopics, scanning probe microscopics, optical microscopics for nanoscience and technology, X-ray diffraction.

UNIT-IV

Nanobiology : Interaction between bimolecules and nanoparticle surface, Different types of inorganic materials used for the synthesis of hybrid nano-bio assemblies,

Unit - V

Application of nano in biology, nanoprobes for Analytical Applications-A new Methodology in medical diagnostics and Biotechnology, Current status of nano Biotechnology, Future perspectives of Nano biology,

UNIT-VI

Nanomedicines : Developing of Nanomedicens Nano sytems in use, Protocols for nanodrug Administration, Nanotechnology in Diagnostics applications, materials for used in Diagnostics and Therapeutic applications,

Molecular Nano mechanics, Molecular devices, Nanotribology, studying tribology at nanoscale, Nano tribology applications.

TEXT BOOKS:

- 1. T.Pradeep ,Nano: The Essentials- Tata Mc Graw Hill Publishing company Limited New Delhi
- 2. Nano Materials- A.K.Bandyopadhyay/ New Age Publishers.

Note:

Internal Assessment: The question paper for sessional examination shall have one *compulsory* question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

List of Interdisciplinary Electives

- **Optimization Techniques** 1 **IDE301**
- Remote Sensing and GIS 2 3 IDE302
- New and Renewable Energy Systems **IDE303**
- 4 Artificial Intelligence and Expert Systems IDE304
- 5 Nanotechnology **IDE305**
- Introduction to Information Systems 6 IDE306
- 7 IDE307 Mechatronics
- 8 Control and Automation **IDE308**
- 9 Web Development Programme **IDE309**
- Environmental and Water Resources Engineering 10 IDE310

IDE 301: OPTIMIZATION TECHNIQUES (OT) (Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme Internal assessment	: 2013 : 30	L	T/D	Р	С
End Exam Marks	: 70	3	-	-	3

Course outcomes : Students will be able to

- Develop mathematical models from the verbal description of the real system.
- Understand the importance of mathematical modeling in solving practical problems in industry.
- Suggest proper deployment of scarce resources and provide optimum solution.

Unit- I

Introduction : Definition, Nature and Significance of Operations Research , Models in Operations Research, Application Areas of Operations Research in Management.

Linear Programming: Model Formulation, Graphical solution of L.P.P, Slack, Surplus and Artificial variables, Simplex method, Big M method, Degeneracy in L.P.P, Dual linear programming problem, Solution of the Primal problem from the solution of the Dual Problem. Unit – II

Transportation Problems: Balanced and unbalanced Transportation problems, Initial basic feasible solution using N-W corner rule, least cost entry method and Vogel's approximation method, Optimal Solution, Degeneracy in Transportation Problem.

Assignment Problems: The Assignment Algorithm (Hungarian Assignment method), Balanced and Unbalanced Assignment Problems, Travelling Salesman Problem as an Assignment Problem **Unit- III**

Game Theory : Definitions and Terminology, Two Person Zero Sum Games, Pure Strategy Games (with Saddle Point), Principal of Dominance, Solution for Mixed Strategy Games (Game without Saddle Point),

Queuing Theory: Introduction, single channel - poission arrivals - exponential service times with infinite population, Multi channel - poisson arrivals - Exponential service times with infinite population.

Unit – IV

Project Management: Phases of project management, guidelines for network construction, critical path, forward and backward pass, floats and their significance, crashing for optimum duration.

Sequencing Models :Introduction, General assumptions, processing n jobs through 2 machines, processing 'n' jobs through m machines, Processing 2 jobs through m machines.

Unit - V

Dynamic Programming: General Concept of Dynamic Programming, Problems related to general allocation and capital investment decisions.

Unit – VI

Inventory Control: Definition, Costs associated with inventory, Basic EOQ model, Inventory control systems – P System, Q System, ABC analysis, VED analysis

Simulation: Introduction, Advantages of Simulation, Generation of Random numbers, Simulation Languages, Monte Carlo Simulation, Application of Simulation to queuing theory, inventory control

Text Books :

- 1. Hamdy, A. Taha, Operations Research-An Introduction, Prentice Hall of India Pvt. Ltd.,
- 2. S.D. Sharma, *Operations Research*, Kedarnath, Ramnath & Co., Meerut,
- 3. R. Paneer Selvam, Operations Research, PHI Learning Pvt. Ltd., New Delhi.

Reference Books:

- 1. Hillier / Libernam, Introduction to Operations Research , Tata McGraw Hill Edition
- 2. J.K. Sharma, *Operations Research*-Problems and Solutions, Macmillan India Ltd.
- 3. Billy E Gillett, *Introduction to Operations Research A Computer Oriented Algorithmic Approach*, Tata McGraw Hill Edition.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

IDE 302 Remote Sensing And Geographic Information System (RS&GIS) (Interdisciplinary Elective for B. Tech – VI Semester)

Scheme: 2013Internal Assessment: 30End Exam Marks: 70

L	T/D	Р	С
3	-	-	3

Course Outcomes: On completion of this course, the student will be able to

- 1. Explain the principles and applications of Remote Sensing and various types of platforms used in Remote Sensing.
- 2. Explain the applications of GIS.
- 3. Explain GIS data types and Input techniques.

UNIT – I

Introduction To Remote Sensing:

Concept and Scope of Remote Sensing: Definitions, Process and Characteristics of Remote Sensing System, Advantages and limitations.

Concept of Electromagnetic Radiation (EMR): Wavelength-frequency-energy relationship of EMR, EMR Spectrum and its properties, EMR wavelength regions and their applications, Interaction of EMR with matter, Spectral signatures.

Energy Interaction in the atmosphere and with Earth Surface Features: Scattering, absorption, transmission, atmospheric windows Spectral Reflectance Curve, Concept of signatures.

UNIT – II

Platforms and Sensors:

Introduction: Sensor materials, Sensor System - Framing and Scanning System, Whiskbroom scanners, Push-broom scanners, Side Looking scanner.

Types and Characteristics of Sensor: Imaging and non-imaging sensors, Active and passive sensors, Resolution of Sensors - Spectral, Spatial, Radiometric & Temporal, Scale, Mapping unit, Multi-band concepts and False Colour Composites.

Remote Sensor Platforms and Satellite Orbits: Ground, Airborne and Space borne Platforms, Orbital Characteristics – Coverage, Passes, Pointing Accuracy, Geostationary, Sun synchronous, shuttle orbit.

Space Imaging Satellites: Early history of space imaging; Multispectral and Hyperspectral sensors, Radar, Lidar; Specification of some popular satellites – IRS, Landsat and SPOT series; High resolution satellites – IKONOS, Cartosat, Quickbird, OrbView, GeoEye, Pléiades, WorldView; Other latest earth resource satellites.

UNIT – III Remote Sensing Applications:

Scope of Remote Sensing Applications - Potentials and Limitations.

Applications in land use and land cover analysis.

Resource evaluation - Soils, minerals forest and agriculture.

Water Resource Applications- Mapping, monitoring of surface water bodies, tanks, lakes/ reservoirs.Environmental applications.

$\mathbf{UNIT} - \mathbf{IV}$

Geographic Information System:

Basic Concepts: Definition of GIS, Components of GIS, Variables - points, lines, polygon, Functionality of GIS, Areas of GIS application, Advantage and Limitation of GIS

UNIT – V

GIS Data: Spatial and Attribute Data, Information Organization and Data Structures - Raster and Vector data structures, Data file and database

Creating GIS Database: GIS Software's, file organization and formats, Geo-database, Rectification, Digitization and Map Composition

UNIT – VI

GIS Data Input & Editing: Nature and Source of data, Method of spatial and Attribute data capture - Primary and Secondary, digitization and scanning method, Techniques and procedure for digitizing, Errors of Digitization and rectification, Re-projection, Transformation and Generalization, Edge matching and Rubber sheeting, Topology.

Text Books:

- 1. M. Anji Reddy; *Text Book of Remote Sensing and Geographic Information System*, BS Publication.
- 2. Lo C.P. & Yeung A.K.W., (2004). *Concepts and Techniques of GIS*, Prentice-Hall of India, New Delhi.

Reference Books:

- 1. B.Bhatta; Remote sensing and Geographic Information System, Oxford Publications.
- 2. Siddiqui, M.A.; 2006, *Introduction to Geographical Information System*, Sharda Pustak Bhavan, Allahabad.
- 3. Curran, Paul J; 1985, Principles of Remote Sensing, Longman, London.
- 4. NRSA, IRS, Data User Handbook, Hyderabad

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

IDE 303: NEW AND RENEWABLE ENERGY SYSTEMS (NRES) (Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme: 2013Internal Assessment: 30End Exam Marks: 70

Course outcomes:

The student will be able to

- 1. Understand the various alternate sources of energies
- 2. Classify various renewable energy sources
- 3. Describe various RES power plants
- 4. Solve solar and wind power plant related problems

Unit - I

Introduction and Energy Conservation: Classification of energy sources-Importance of renewable energy sources and energy chain-Principles of energy conservation –Energy conservation opportunities

Fundamentals of Solar Energy: Extra terrestrial and terrestrial radiation- Solar constant and solar radiation geometry-Solar time and day length-Estimation of monthly average daily total radiation on horizontal surface and tilted surface-Measurements of radiation data.

Unit - II

Solar Collecting Devices : Flat plate collector- Losses associated with collector-Method of determination of top loss, side loss and bottom loss coefficient -Performance parameters affecting the collector performance-Efficiency of flat plate collector-selective surfaces- Air collectors- Classification of concentrating collector-Tracking of CPC collector

Solar Thermal Systems: Methods of storing solar energy-Solar water heating-Solar refrigeration system – Solar thermal power generation-Solar distillation-Solar space heating **Unit - III**

Solar Voltaic Systems & Emerging Technology: Basic principle of PV cell-Arrangements of PV cell-classification of PV cell-Principle of magneto hydro dynamics-thermo electric and thermionic conversion, Introduction to Fuel cell.

Unit - IV

Wind Energy: Origin of wind-Application of wind power –Betz limit-Components of Horizontal axis wind turbine-Types of blades- Classification of vertical axis turbine **Unit - V**

Biomass Energy: Photosynthesis process- Biomass conversion technologies- Biogas production - Types of digester- Factors affecting the digester performance

Geothermal Energy: Types of geothermal energy resources-Energy conversion through geothermal energy resources-Environmental consideration

Unit - VI

Ocean Thermal Energy Conversion: Principle of OTEC- Anderson and Claude cycles

Tidal energy: Introduction- tidal energy conversion methods,

Wave energy: Introduction, conversion methods

Text Book:

L	T/D	Р	С
3	-	-	3

1. B.H.Khan, *Non-conventional Energy Sources*, TMH Publishers, New Delhi. 2003 **Reference Books**:

- 1. G.D Rai, Non-conventional Energy Sources, Khanna Publishers, New Delhi. 1989
- 2. S.Rao and Paulekar, Energy Technology, Khanna Publishers, New Delhi. 2000
- 3. W.R.Murphy& G.Mckay, *Energy Management*, Butterworth & Co. Publishers, New Delhi. 2001
- 4. B.Sreenivasa Reddy & K.Hemachandra Reddy , *Thermal data hand book*, IK International Publishers, Bangaloore 2007

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

IDE 304:ARTIFICIAL INTELLIGENCE AND EXPERT SYSTEMS(AIES) (Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme Internal Assessment	: 2013	L	T/D	Р	С
End Exam Marks	: 70	3	-	-	3

Course Outcomes:

Student will be able to:

- Demonstrate fundamental understanding of the history of artificial intelligence (AI) and its foundations.
- Apply basic principles of AI in solutions that require problem solving, inference, perception, knowledge representation, and learning.
- Demonstrate awareness and a fundamental understanding of various applications of AI techniques in intelligent agents, expert systems and other machine learning models.
- Gain on working of an expert system.

Unit:I

Introduction: What Is AI?, The Foundations of Artificial Intelligence, The History of Artificial Intelligence.

Unit: II

Intelligent Agents: Agents and Environments, Good Behavior: The Concept of Rationality, The Nature of Environments, The Structure of Agents.

Unit: III

Solving Problems by Searching: Problem-Solving Agents, Example Problems, Searching for Solutions, Uninformed Search Strategies.

Unit: IV

Informed (Heuristic) Search Strategies- Greedy best-first search, A* search, Memory-bounded heuristic search, Learning to search better. Heuristic Functions.

Unit: V

Beyond Classical Search: Local Search Algorithms and Optimization Problems, Local Search in Continuous Spaces, Searching with Partial Observations.

Unit: VI

Introduction to Expert System: What are Expert Systems, Features of Expert system, Features of good expert system, Role of human in Expert system, Expert system organization, Difference between expert system and conventional program, Basic activities of expert system and the areas in which they solve problems, Prospector system features, working.

Text Books:

- 1. Stuart Russell and Peter Norvig, "*Artifcial Intelligence: A Modern Approach*" Third Edition, 2010. Pearson Education.
- 2. Donald A.Water man, "A Guide to expert systems", Addison Wesley publishing company.

Reference Books:

- 1. Judea Pearl, "Probabilistic Reasoning in Intelligent Systems", Morgan Kaufmann, 1988.
- 2. Tom Mitchell, "Machine Learning", McGraw Hill, 1997.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

IDE 305:NANO TECHNOLOGY (Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme	: 2013	- 1			
Internal Assessment	: 30	L	T/D	P	С
End Exam Marks	: 70	3	-	-	3

Course Outcomes

- The students acquire some of the fundamental principles behind nanotechnology and nano materials and their vital role in novel sensing properties and applications.
- The students understand the fabrication, characterization, and manipulation of nano materials, nano sensors, and how they can be exploited for new applications

Unit-I

Introduction to Nanotechnology: Definition of nanotechnology; main features of nano materials; types of nanostructures (0D, 1D, and 2D structures); nano composites; and main chemical/physical/electrical/optical properties of nano materials. Methods for characterizing the nano materials: Atomic Force Microscopy (AFM), Scanning Electron Microscopy (SEM), Transmission Electron Microscopy (TEM), and spectroscopy- and spectrometry-based surface analysis techniques. Fabrication of sensors by bottom-up and top-down approaches; self-assembly of nanostructures; and examples for nanotechnology application

Unit-II:

Introduction to Sensors' Science and Technology: Definition of sensors; main elements of sensors; similarities between living organisms and artificial sensors; working mechanism of physical sensation (seeing, hearing, and feeling) and chemical sensation (smelling and tasting); the parameters used for characterizing the performance of sensors: accuracy, precision, sensitivity, detection limit, dynamic range, selectivity, linearity, resolution, response time, hysteresis, and life cycle.

Unit-III:

Metal nanoparticle-based Sensors: Definition of nanoparticle; features of nanoparticles; and production of nanoparticles by physical approach (laser ablation) and chemical approaches (Brust method, seed-mediated growth, etc.).Quantum Dot Sensors. Definition of quantum dot; fabrication techniques of quantum dots; Macroscopic and microscopic photoluminescence measurements; applications of quantum dots as multimodal contrast agents in bioimaging; and application of quantum dots as biosensors.

Unit-IV:

Nanowire-based Sensors: Definition of nanowires; features of nanowires; fabrication of individual nanowire by top-down approaches and bottom-up approaches; and fabrication of nanowire arrays (fluidic channel, blown bubble film, contact printing, spray coating, etc.).Carbon **Nanotubes-based Sensors:** Definition of carbon nanotube; features of carbon nanotubes; synthesis of carbon nanotubes; fabrication and working principles of sensors based on individual carbon nanotube; fabrication and working principles of sensors based on random array of carbon nanotubes.

Unit-V:

Sensors Based on Nanostructures of Metal Oxide: Synthesis of metal oxide structures by dry and wet methods; types of metal oxide gas sensors (0D, 1D, and 2D); defect chemistry of the

metal oxide sensors; sensing mechanism of metal-oxide gas sensors; and porous metal-oxide structures for improved sensing applications.

Unit-VI:

Mass-Sensitive Nanosensors: Working principle of sensors based on polymeric nanostructures; sensing mechanism and applications of nanomaterial-based of chemiresistors and field effect transistors of (semi-)conductive polymers, w/o inorganic materials.

Arrays of Nanomaterial-based Sensors: A representative example for the imitation of human senses by means of nanotechnology and nanosensors: electronic skin based on nanotechnology.

Textbooks:

- 1. Jiří Janata, Principles of Chemical Sensors, Springer, 2d Edition (1989).
- 2. Roger George Jackson, Novel Sensors and Sensing, CRC Press (2004).

Reference Books:

- 1. Florinel-Gabriel Banica, *Chemical Sensors and Biosensors: Fundamentals and Applications*, John Wiley and Sons (2012).
- 2. Ramsden Jeremy, Nanotechnology, an Introduction. Elsevier (2011).

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

IDE306: INTRODUCTION TO INFORMATION SYSTEMS (IIS) (Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme: 2013Internal Assessment: 30End Exam Marks: 70

L	T/D	Р	С
2	2		3

Course Outcomes:

Student will be able to:

- learn the concepts of computer organization, operating systems, compiler design including its phases and components and become acquainted with the life cycle of software project and its various phases
- use SQL, to create Database objects

Unit-I

Fundamentals of Computers & Computer Architecture: Introduction, Organization of a small computer, Central Processing Unit, Execution cycle, Instruction categories, measure of CPU performance Memory, Input/output devices, BUS, addressing modes

System Software: Assemblers, Loaders and linkers, Compilers and interpreters.

Unit-II

Operating System: Introduction, Process Management, CPU scheduling, Memory Management Schemes, Page replacement algorithms.

Software Engineering: Introduction to software engineering, Life cycle of a Software Project, Software Development Models.

Unit-III

Coding Standards and Best Practices: Introduction to C Programming, Basics of C Language, Data Types in C, Functions, arrays, pointers, structures.

Sorting and Searching Techniques: Searching Algorithms – Linear Search, Binary Search, Sorting Algorithms – Bubble Sort, Selecting Sort and Insertion Sort.

Unit-IV

Relational Database Management System: Introduction to DBMS, the database technology, data models. Database Users.

Entity Relationship (E-R) Modeling: Introduction, Notations, Modeling E-R Diagrams, Case Study1,2 & 3, Merits and Demerits of E-R modeling.

Unit-V

Normalization: Introduction, Need for Normalization, Process Normalization, Types of Normal Forms (1 NF, 2 NF, 3 NF & BCNF), Merits and Demerits of Normalization.

Unit-VI

Structured Query languages (SQL): History of SQL, Data Types, Data Definition Language Statements (DDL), Data Manipulation Language (DML), Data Control Language (DCL), writing simple queries.

Text Books:

- 1. Campus Connect Foundation Program *Computer Hardware and System Software Concepts, Programming Fundamentals* Vol. 1, INFOSYS.
- 2. Campus Connect Foundation Program *Relational Database management System, Client Server Concepts, Introduction to Web Technologies* Vol. 2, INFOSYS
- 3. Campus Connect Foundation Program Object Oriented Concepts System Development Methodology, User Interface Design - Vol. – 3, INFOSYS
- 4. Yashwant Kanetkar, *Let us ''C''* bpb Publications 8th ed., 2007.

Reference Books:

- 1. Andrew S. Tanenbaum, *Structured Computer Organization*, PHI, 3rd ed., 1991
- 2. Silberschatz and Galvin, Operating System Concepts, 4th ed., Addision-Wesley, 1995
- 3. Wilbert O. Galitz, Essential Guide to User Interface Design, John Wiley, 1997
- 4. Alex Berson, Client server Architecture, Mc Grew Hill International, 1994
- 5. Henry F Korth, Abraham Silberschatz, *Database System Concept*, 2nd Edition, McGraw-Hill International editions, 1991
- 6. Roser S. Pressman, *Software Engineering-A Practitioners approach*, McGraw Hill, 5th ed., 2001

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

IDE 307: Mechatronics (MT) (Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme	: 2013	L	T/D	Р	С	
Internal assessment	: 30					l
End Exam Marks	: 70	3	-	-	3	

Course Outcomes:

• At the end of the course students able to learn & achieve in-depth knowledge in the fundamentals, design, analysis and operation of mechatronic systems..

UNIT-I

Introduction: Definition of Mechatronics, Mechatronics in manufacturing, Products, and design. Comparison between Traditional and Mechatronics approach.

UNIT-II

Review of fundamentals of electronics. Data conversion devices, sensors, microsensors, transducers, signal processing devices, relays, contactors and timers. Microprocessors controllers and PLCs.

UNIT-III

Drives: stepper motors, servo drives. Ball screws, linear motion bearings, cams, systems controlled by camshafts, electronic cams, indexing mechanisms, tool magazines, transfer systems. **UNIT-IV**

Hydraulic systems: flow, pressure and direction control valves, actuators, and supporting elements, hydraulic power packs, pumps. Design of hydraulic circuits.

UNIT-V

Pneumatics: production, distribution and conditioning of compressed air, system components and
graphic representations, design of systems. DescriptionUNIT-VI

Description of PID controllers. CNC machines and part programming. Industrial Robotics.

TEXT BOOKS:

- 1. HMT ltd. Mechatronics, Tata Mcgraw-Hill, New Delhi, 1988.
- 2. G.W. Kurtz, J.K. Schueller, P.W. Claar . II, Machine design for mobile and industrial applications, SAE, 1994.
- 3. T.O. Boucher, Computer automation in manufacturing an Introduction, Chappman and Hall, 1996.

REFERENCE BOOKS:

- 1. R. Iserman, Mechatronic Systems: Fundamentals, Springer, 1st Edition, 2005
- 2. Musa Jouaneh, Fundamentals of Mechatronics, 1st Edition, Cengage Learning, 2012.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

IDE308: Control & Automation (CA) (Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme: 2013Internal assessment: 30End Exam Marks: 70

Course Outcomes:

- Represent the mathematical model of a system
- Determine the response of different order systems for various step inputs
- Analyze the stability of the system.
- Demonstrate an ability to program Programmable Logic Controllers using ladder logic and other programming standards
- Describe the advantages, use and applications of Programmable Logic Controllers (PLC's).

Unit – I

Modeling of Linear Control Systems: open-loop and closed-loop systems, control system components, Advantages, disadvantages & Applications of automated control system. Servo motors, position control systems, Transfer functions, equations of electrical and mechanical systems.

Unit – II

Block Diagrams: block diagram representation and manipulation, signal flow graphs-mason's gain formula to determine overall system gain.

Feedback Characteristics of Control Systems: Feedback and non-feedback systems, effects of feedback.

Unit – III

Time Response: Types of input, transient response of second order system for step input, timeresponse specifications, steady state error and error constants, proportional, derivative and integral controls.

Concept of Stability: Stability of systems-Routh Hurwitz criterion.

Compensation (Without Design): The necessity of compensation, series and parallel compensation. Realization of basic lead, Lag and lead-Lag compensators.

Unit – IV

Root Locus: Definition of Root Locus, construction Procedure, properties of typical systems analyzed by root locus techniques. Bode Plot

Unit – V

PLC Basics: PLC system, I/O modules and interfacing, CPU processor, programming Equipment, programming formats, construction of PLC ladder diagrams, Devices connected to I/O modules.

PLC Programming: Input instructions, outputs, operational procedures, programming examples using contacts and coils. Drill press operation

Unit – VI

L	T/D	Р	С
3	-	-	3

Digital logic gates: Programming with logic gates, programming in the Boolean algebra system, conversion examples

PLC Functions: Timer functions & Industrial applications, counters, counter function industrial applications, Arithmetic functions, Number comparison functions, number conversion functions

TEXT BOOKS:

- 1. Nagrath and Gopal, "Control systems Engineering", New Age International Publications. 2003
- 2. B.C.Kuo, "Automatic Control Systems", Oxford. 2003
- 3. K. Ogata, "Modern control Engineering", Pearson 2003
- 4. Naresh K.Sinha, "Control Systems", New Age International Publishers. 1998
- 5. B.S.Manke, "Linear Control Systems". 1996
- 6. John W. Webb & Ronald A. Reiss, "Programmable Logic Controllers- Principles and Applications" Fifth Edition, PHI

REFERENCE BOOKS:

- 1. Madan Gopal, "Control Systems", TMH. 2003
- 2. Dorf, Bishop, "Modern Conrtol systems", Addison Wesley 1998
- 3. (Shaum's out line series), "Feedback control systems", TMH 1986
- 4. R.C.Shukla, "Control Systems", Dhanpat Rai.
- 5. Ashok Kumar, "Control Systems", TMH.
- 6. JR. Hackworth & F.D. Hackworth Jr., "Programmable Logic Controllers- Programming Method and Applications", Pearson. 2004

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

End Exam: The question paper for end examination shall consist of One Compulsory question consisting of objective type, fill in the blanks etc for 10 marks and for the remaining 60 marks student has to answer any four questions out of 6 questions for 15 marks each.

IDE 309: WEB DEVELOPMENT PROGRAMMING (WDP) (Interdisciplinary Elective for B. Tech. – VI Semester)

Scheme	: 2013	L	T/D	Р	С
End Exam Marks	: 70	2	2	-	3

Course Outcomes:

Student will be able to:

- Develop the skill & knowledge of Web page design.
- Understand the knowhow and can function either as an entrepreneur or can take up jobs in the multimedia and Web site development studio and other Information technology sectors.

Uni1-1

Introduction To The Web: Understanding The Internet And World Wide Web, History Of The Web, Protocols Governing The Web, Creating Websites For Individuals And The Corporate World, Web Applications, Writing Web Projects, Identification Of Objects, Target Users, Web Team.

Unit-2

Planning and process development: Planning And Process Development, Web Architecture, Major Issues In Web Solution Development, Web Servers, Web Browsers, Internet Standards, TCP/IP Protocol Suite, IP Addresses, Cyber Laws.

Unit-3

Hypertext Transfer Protocol: Introduction, Web Servers And Clients, Resources, URL And Its Anatomy, Message Format, Persistent And Non Persistent Connections, Web Caching, Proxy. **Unit-4**

Hypertext Markup Language (HTML): History Of HTML And W3C, Html and Its Flavors, Html Basics, Elements Attributes And Tags, Basic Tags, Advanced Tags, Frames, Images, Meta Tag, Planning Of Web Page, Model And Structure For A Website, Designing Web Pages, Multimedia Content Frames.

Unit-5

Cascading Style Sheet(CSS): Introduction, Advantages, Adding CSS, Browser Compatibility, CSS and Page Layout, Selectors.

Unit-6

Hosting And Promoting Websites: Structure of Websites, Web Development Tools, Web Files Using Microsoft Word, Microsoft Front Page, Adobe Dreamweaver, GIF Animator, Hosting Websites, Getting A Domain Name, Redirectors On The Web, Server Software, Submitting For Search Engines, Visitor Analysis And Statistics, Website Promoting Methods.

Text books:

- 1. Utam K.Roy, "Web Technologies", Oxford Higher Education.
- 2. K.L.James, "The Internet- A User Guide", 2nd Edition, PHI Publications.

Reference books:

- 1. Kognet Learning Solutions inc., "HTML5 in Simple Steps". Dreamtech press.
- 2. Steven M.Schafer, "HTML, XHTML and CSS Bible 5th Edition", Wiley India.

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

IDE 310 Environmental and Water Resources Engineering

(Inter disciplinary Elective for B. Tech. - VI Semester)

Scheme	: 2013	L	T/D	Р	С
Internal Assessment End Exam Marks	: 30 : 70	3	-	-	3

Course Outcomes : Students shall be able to identify the source of waste water and solid waste, identifying the physical, chemical and biological properties of waste water, India's water budget, Irrigation methods, fundamentals of Hydro power development.

Unit – I

Water Supply System : Need for protected water supply system – Objectives of Water supply system – Routine water analysis for physical, chemical and bacteriological characteristics and their significance – Standards for drinking water – Water borne diseases and their control.

Unit – II

Sanitation: Aim and objectives of sanitation – Conservancy and water carriage systems – Classification of sewerage systems – Separate, combined and partially combined systems – disposal of domestic waste water.

Unit – III

Urban Solid Waste Management: Types, sources, quantity and composition of urban solid waste – Collection, transportation, recovery & reuse – Disposal methods such as composting, incineration, sanitary land fill.

Unit – IV

Hydrology: Hydrologic cycle – Global water budget – India's water budget – Practical applications of Hydrology – Climate and weather seasons of India – Floods – Flood management.

Unit – V

Water Resources Development: Planning for WRD – Purposes of WRD project multipurpose project – Functional requirements – Financial analysis of a project – Irrigation methods – Ground water – Geological formations – other sources of ground water – Water wells.

Unit – VI

Water Power Engineering: Sources of energy – Classification – Types of power planning for water power development – History – Advantages – Comparison – Layout of hydro power plant – Economics of Hydro power development.

Text Books:

1. Santosh Kumar Garg [1992], Environmental Engineering Vol.1, Khanna Publications.

- 2. P. Jaya Rami Reddy, A Text book of Hydrology (3rd Edition, 2011), Laxmi Publications, New Delhi.
- 3. Dr. P.N. Modi [2014], Irrigation and water Resources Engineering, Standard Book House

Reference books:

- 1. S.K.Hussain [1994], Water supply and sanitary Engineering, Oxford & IBH.
- 2. H.M. Raghunath [2009], Groundwater, Wiley Eastern Ltd
- 3. K.Subramanya, *Engineering Hydrology*, Tata Mc Graw Hill Publishing Co. Ltd, New Delhi.
- 4. M.M. Dandekar and K.N. Sharma [2010], *A Text Book of Water Power Engineering*, Vikas Publications.

5.R.K.Sharma and T.K.Sharma [2003], A Text book of Water Power Engineering including Dams, Engg. Hydro & Fluid Power Engg., S. Chand Company Ltd., New Delhi–110 055

NOTE:

Internal Assessment: The question paper for sessional examination shall have one compulsory question carrying 6 marks and five other conventional (descriptive or analytical type) questions carrying 8 marks each. The compulsory question consists of objective type questions like the multiple choice, fill in the blanks etc. Apart from the compulsory question, the student has to answer any 3 from the remaining 5 conventional questions.

List of Global Electives

- 1 GE401 Introduction to Psychology
- 2 3 Research Methodology GE402
- Entrepreneurship Development GE403
- 4 Intellectual Property Right and Patent Filing GE404
- 5 Constitution of India GE405
- 6 Ethical Hacking GE406
- 7 Information Security and Cyber Laws GE407
- 8 GE408 Foreign Languages

GE401: Introduction to Psychology (IPY) (Global Elective for B. Tech. – VII Semester)

Scheme Internal assessment	: 2013 : 100	L	T/D	Р	С	-
		2	-	-	2	

Course Outcomes:

• Be able to articulate the general history of psychology by explaining depth and breadth of the field from the field from the perspective of a future educator or researcher.

Unit – I

Introduction: Defining Psychology & Behavior-Branches and fields of Psychology,Utility of Psychology

Methods of Psychology: Introspection Method, Naturalistic observation, Experimental Method-Differential Method, Clinical Method, Psycho Physical Methods

Unit – II

Physiological Basis of Behavior: The Neuron-Central Nervous system, Brain and localization of Brain functions, Spinal chord Influence of Nervous system on human behaviour, Endocrine system and it's impact, The role of heredity and environment in the development of personality

Unit – III

Instincts, Emotions Senses and Sensitivity: Instincts and Reflex actions-Emotion & it's characteristics-Physiology of Emotions-Sensation and Sensitivity

Unit – IV

Thinking, Reasoning and Problem solving : Nature of thinking-Elements of thoughts, Tools of Thinking, Rigidity, Types of thinking, Reasoning & types, Problem solving and it's methods Unit - V

Motivation and Behavior & Attention & Learning: Biological and socio psychological Needs, Drives and Incentives, Motives and Types of Motives, Types & Effect of attention, Types of Learning, Problem Solving, Mechanism of Memorization

Unit – VI

Intelligence, Aptitude, Personality : Nature of Intelligence-Concept of Metal age and IQ-Constantly of IQ-IQ Classification, Aptitude Ability & Achievement, Measurement of Aptitude, Features and Characteristics of Personality, Personality Assessment, Walters social Learning Theory

TEXT BOOKS:

1. S.K. Mangal, "*General Psychology*", Sterling Publishers Private Limited **REFERENCE BOOK:**

1. Saundra K.Ciccarelli&Gkenn E.Meyer, "Psychology", Dorliing Kindersley (I) Pvt Limited

NOTE:

INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of
GE402: Research Methodology (RM) (Global Elective for B. Tech. – VII Semester)

Scheme : 2013 Internal assessment : 100

L	T/D	Р	С
2	-	-	2

Course Outcomes:

- Able to understand overview of research process, state research problem and conduct a preliminary literature review of the concepts comprising the research questions.
- Student able to study the features and uses & evaluation of data.
- Able to understand the organization structure and style of report writing.
- Able to understand that precautions which are to be taken while writing research report.

Unit – I

Research Methodology: Introduction –Meaning-Objectives & Motivation of Research-Types & Significance of Research-Research Methods (Vs) Methodology.

Researching process-Technique involved in defining a problem- Definition of a Hypothesis Role of Hypothesis-Types of Hypothesis-Criteria of Good Hypothesis.

Unit – II

Research Design and Sampling Design: Need for Research Design-Features of good Design-Concepts Related to Research Design-Different research designs-Basics Principles of Experimental Designs-Steps in sampling design-Characteristics of good sample design-Various types of sample designs-Complex Random sampling designs

Unit-III

Measurement and Scaling Techniques: Errors in Measurement, Tests of Sound Measurement, Scaling and Scale Construction Techniques, Forecasting Techniques, Time Series Analysis, Interpolation and Extrapolation.

Unit – IV

Data Collection and Processing:

Primary Data: Data Collection through observation method & Interview Method-Data Collection through Questionnaires & schedules- Comparison of data collection methods- -Collection of Secondary data.

Processing: Measures of Central Tendency-Measures of Dispersion-Measures of Asymmetry - Measures of Relationship-Simple Regression Analysis-Chi-square Test for comparing valiance

Unit – V

Correlation and Regression Analysis: Method of Least Squares, Regression Vs. Correlation, Correlation Vs Determination, Types of Correlation and Their Specific Applications.

Sampling Fundamentals: Central Limit Theorem-Sampling Theory-Concept of standard error-Estimating population Mean-Sample size & Determination

Unit – VI

Interpretation of Data and Report Writing: Meaning-Technique & precautions of Interpretation Significance of Report writing, Steps- Layout of a Research report, -Types of Reports-Mechanics of writing a Research Report- Precautions of Report Writing.

TEXT BOOKS:

1. C.R. Kothari, "*Research Methodology (Methods & Techniques)*", New Age International Publishers.

REFERENCE BOOKS:

1. R. Cauvery, V. K. Sudha Nayak, M. Girija, "Research Methodology", S. Chand Publications.

NOTE:

INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of 10 questions of two marks each. Four questions to be answered from the remaining five questions and each question carries 7.5 marks.

GE403: Entrepreneurship Development (ED) (Global Elective for B. Tech. – VII Semester)

Scheme : 2013 Internal assessment : 100

L	T/D	Р	С
2	-	-	2

Course Outcomes:

• Be able to build on personal as well as external resources with a view to successfully launching and subsequently managing their enterprises.

Unit - I

Introduction: Concept of an entrepreneur; Definition of an entrepreneur; Types of entrepreneurs; Characteristics of an entrepreneur.

Entrepreneurship: Definitions; Theories of entrepreneurship; Key elements of entrepreneurship; Six important segments of entrepreneurship environment; Advantages of entrepreneurship; Barriers to entrepreneurship; Role of entrepreneurship in economic development.

Unit – II

Rural Entrepreneurship: Meaning; Need; Retrospection of rural industrialization in India; Problems of rural entrepreneurship; Development plan for rural entrepreneurship.

Small Enterprises : Definition of SSI; Types, Characteristics of SSI; Role of SSI in economic development; Problems faced by SSI.

Unit – III

Project Planning: Project Identification; Project Selection; Project Report – Contents & Formulation; Methods of Project Appraisal.

Unit – IV

Ownership Structures: Sole Proprietorship; Partnership; Company; Co-operative; Selection of appropriate ownership structure.

Unit – V

Institutional Finance: Commercial banks; Other Financial Institutions – IDBI, IFCI, ICICI, IRBI, SFC, SIDC,

SIDBI & EXIM Bank.

Unit – VI

Institutional Support: Need; Support to Small Entrepreneurs – NSIC, SIDO, SSIB, SSIDC, SISI, DICs

TEXT BOOKS:

1. Prof. Satish C. Ailawadi & Mrs. Romy Banerjee, "Principles of Entrepreneurship", Everest Publishing HousePub.

REFERENCE BOOKS:

1. S.S. Khanka, "Entrepreneurial Development", S. Chand & Company Ltd. Pub.

NOTE:

INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of

GE404: Intellectual Property & Patent Filing (IPPF) (Global Elective for B. Tech. – VII Semester)

Scheme Internal assessment	: 2013 : 100	L	T/D	Р	С
		2	-	-	2

Course Outcomes:

• Be able to acquire fundamental competencies with regard to intellectual property rights.

Unit – I

Basics of IPR: Introduction to intellectual property right (IPR) -Need for IPR in India-Systems-Benefits of IPR-Various Types of IPR-Violation of IPR

Unit – II

Patents: Introduction to Patents-Various kinds of Patents-Patenting Process-Patent and kind of inventions protected by patent- Patent documents- How to protect your inventions? -Granting of patent Rights of a patent -How extensive is patent protection-Searching a patent -Drafting of a patent

Unit – III

Copy Right: What is copyright?- What is covered by copyright?- Fair use of copyrighted works (e.g., for classroom use)-Contributory copyright infringement -Rights covered by copyright?- Critical differences between patent and copyright protection-Copyright infringement distinguished from plagiarism- Remedies against Infringement

Unit – IV

Method of Designing Registrations: Designing Registrations-How Chart for Registration-Trade Mark-Geographical Indications Integrated Circuits-Trade Secrets

Unit – V

IPR Policy: IP in various sectors like Government and Nation-R &D organizations-IT, Media,Entertainment.

Unit – VI

Management of Intellectual Property Rights-Trademarks, Geographical Indications and Domain Names-Chemical Engineering & Services Sector-Industries & Small Scale Industry

TEXT BOOKS:

- 1. "Intellectual Property Rights: Key to New Wealth", National Research Development Corporation
- 2. Prabuddha Ganguli, "Intellectual Property Rights", TMH

REFERENCE BOOKS:

1. P. Narayanan; "Law of Copyright and Industrial Designs"; Eastern law House, Delhi, 2010

NOTE:

INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of

GE405: Constitution of India (CI) (Global Elective for B. Tech. – VII Semester)

Scheme : 2013 Internal assessment : 100

L	T/D	Р	С
2	-	-	2

Course Outcomes:

• Be able to know how constitution governs the allocation of power in society and the way in which the Indian constitution was made.

Unit – I

Historical back ground, Significance of Constitution, Making of the constitution, Role of the constituent Assembly, Salient features, the Preamble, Citizenship, procedure for amendment of Constitution Fundamental rights-Derivative principles of state policy-Elections in India.

Unit – II

Union Executive: Structures of Union Government & Functions, President, Vice President, Prime Minister, Cabinet Parliament-Supreme Court of India

Unit – III

State Executive: Structures and Functions, Governor, Chief Minister, Cabinet, State Legislature, High Courts & Sub ordinate courts

Unit – IV

Central, State Relations, President's Rule, Constitutional Amendments [42, 44, 74, 76, 86 & 91]-Constitutional functionaries, Working of Parliamentary system in India

Unit – V

Nature, Meaning & Definition, Indian Social Structure, Language in India-Political Parties & Presume groups, Right of Women-S.C's, S.T's & other weaker sections.

Unit – VI

Judiciary: Structure, Organisation of Judiciary, independence of the Judiciary, role and functions of Supreme Court, Judicial Review.

TEXT BOOKS:

- 1. Durga Das Basu, "Introduction to the Constitution of India", Wedwe & Company
- 2. Macivel, Page, "An Introduction Analysis", Society
- 3. M.V. Pylee, "Indian Constitution", S. Chand Publications
- 4. Subhash C Kashyao : "Our Constitution", National Bank, Trust, India.

REFERENCE BOOKS:

- 1. Durga Das Basu, "Introduction to the Constitution of India", Wedwe & Company
- 2. Macivel, Page, "An Introduction Analysis", Society

NOTE:

INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of

GE 406: ETHICAL HACKING (EH) (Global Elective for B. Tech. – VII Semester)

Scheme : 2013 Internal assessment : 100

L	T/D	Р	С
2	-	-	2

Course Outcomes:

- Students will be able to provide security to their own systems.
- Students will learn how to crack the system passwords.
- Students will able to perform penetration tests.
- Students will able to develop an ongoing security strategy.

UNIT I:

Introduction To Ethical Hacking :Basic Terminology, Defining Hacker, Defining Malicious User, Recognizing How Malicious User Beget Ethical Hacker, Ethical Hacking Vs Auditing, Policy Considerations, Compliance And Regulatory Concerns, Understanding The Need To Hack Your Own Systems, Understanding The Dangers Your Systems Face, Non Ethical Attacks, Network Infrastructure Attacks, Operating System Attacks, Application And Other Specialized Attacks.

UNIT II:

Attacks And Ethical Hacking Commandments: Non Ethical Attacks, Network Infrastructure Attacks, Operating System Attacks, Applications And Other Specialized Attacks, Working Ethically, Respecting Privacy, Not Crashing Your Systems, Using The Ethical Hacking Process, Formulating Your Plan, Selecting Tools, Executing The Plan, Evaluating Results.

UNIT III:

Cracking The Hackers Mindset And Ethical Hacking Plan :Think Like Bad Guys, Who Breaks Into Computer Systems, Why They Do It, Planning And Performing Attacks, Maintaining Anonymity, Establishing Your Goals, Determining Which System Hack, Creating Testing Standards, Timing, Running Specific Tasks, Blind Vs Knowledge Assessments, Picking Your Location, Respond The Vulnerabilities, Selecting Security Assessment Tools.

UNIT IV:

Hacking Methodology : Setting The Stage For Testing, Gathering Public Information, Mapping The Networks, Scanning Systems, Determining What's Running On Open Ports, Assessing Vulnerabilities.

UNIT V:

Passwords: Understanding Password Vulnerabilities, Organizational Password Vulnerabilities, Technical Password Vulnerabilities, Cracking Passwords, Cracking The Passwords The Old Fashioned Way, Cracking The Passwords With High-Tech Tools, Cracking Password Protected Files, Understanding Other Ways To Crack Passwords, General Password Cracking Countermeasures.

UNIT VI:

Mobile Devices: Cracking Laptop Passwords, Cracking Phones And Tablets, Cracking ios Passwords.

Text Books:

1. Kevin Beaver, "*Hacking for dummies*", 4th Edition, Wiley India Pvt.Ltd.

Reference Books:

1. Rafay Baloch "A Beginners guide to ethical hacking", www.hacking-book.com.

NOTE:

INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of 10 questions of two marks each. Four questions to be answered from the remaining five questions and each question carries 7.5 marks.

GE 407: Information Security and Cyber Laws (ISCL) (Global Elective for B. Tech. – VII Semester)

Scheme : 2013 Internal Assessment : 100

Course Outcomes:

- Students will understand different threats related to information systems.
- Students will learn about firewall and VPN techniques.
- Students will analyze the security aspects of Databases, OS and Email.
- Students will be aware of the cyber laws, patents and copyright terms.

Unit: I

Information Systems in Global Context: Basics and importance of Information Systems, Changing Nature of Information Systems, Global Information Systems: Role of Internet and Web Services.

Threats to Information Systems: New Technologies Open Door to the Threats, Information-Level Threats versus Network-Level Threats, Threats and Attacks, Classifications of Threats and Assessing Damages, Protecting Information Systems Security.

Unit: II

Building Blocks of Information Security: Principles of Information Systems Security, Three Pillars of Information Security.

Intrusion Detection for Securing the Networks: Intrusion Monitoring and Detection, Intrusion Detection for Information Systems Security.

Unit: III

Firewalls for Network Protection: Firewalls, Demilitarized Zone (DMZ), Need and Protection provided by Firewalls, Proxy Servers, Topologies for Different Types of Firewalls.

Virtual Private Networks for Security: VPN, Need and Role of a VPN for an Enterprise, Working of VPN, VPN Architecture.

Unit: IV

Security of Electronic Mail Systems: Today's Email Usage Scenario, Email System Mechanism, Security Threats posed by Emails, Protection from Threats, Governance for Emails Systems.

Security of Databases: Database Security Issues, Federated Databases: Need and Security Issues, Securing the Mobile Databases, Securing Connectivity with Enterprise Databases, Data Integrity as a parameter for security, Database Security Policy.

L	T/D	Р	С
2	0	0	2

Unit: V

Security of Operating Systems: Operating Systems role in Information Systems Application, Operating System Types, Functions and Tasks, Network Operating Systems and Security, Host Security and OS Hardening, Patched Operating System, OS hardening fundamentals.

Security Models, Frameworks, Standards and Methodologies: Terminology, Methodologies for Information Systems Security.

Unit: VI

Introduction To Cyber Laws: Introduction to Indian Cyber Law, Objective and Scope of the IT Act, 2000, Intellectual Property Issues, Overview of Intellectual-Property- Related Legislation in India, Patent, Copyright, Law Related to Semiconductor Layout and Design, Software License

Text Books:

- 1. Nina God bole, "Information Systems Security: Security Management, Metrics, Frameworks and Best Practices", Wiley India Pvt.Ltd., 2013.
- 2. Surya Prakash Tripati, Ritendra Goel, Praveen Kumar Shukla "Introduction To Information Security And Cyber Laws", Wiley India Pvt.Ltd., 2014.

Reference Books:

1. Michael E. Whitman and Hebert J Mattord, "Principles of Information Security", 4th edition Ed. Cengage Learning 2011

NOTE:

INTERNAL ASSESSMENT: Two Internal Examinations will be conducted for 50 Marks each. The Question paper consists of SIX questions. The FIRST question is compulsory. It consists of 10 questions of two marks each. Four questions to be answered from the remaining five questions and each question carries 7.5 marks.