Mechanical Engineering

SEMESTER III

S. No.	Code No.	Subject	Teaching Periods			Credit Points
			L	T	P	
1.	03IPE101	Mechanics of Solids	3	0	0	3
2.	03IPE102	Material Science & Engineering.	3	0	0	3
3.	03IPE103	Engineering. Thermodynamics	3	0	0	3
4.	03IPE104	Manufacturing .Process	3	0	0	3
5.	03IPE105	Object oriented programming in c++	3	0	0	3
6.	03IPE106	Advance Engineering Mathematics	3	0	0	3
7.	03IPE201	Strength of Material Lab	0	0	2	1
8.	03IPE202	Material Sc. Lab	0	0	2	1
9.	03IPE203	Thermal Engineering Lab	0	0	2	1
10.	03IPE204	Prod. Engineering. Practice	0	0	3	2
11.	03IPE205	Computer Programming Lab	0	0	3	2
12	03IPE206	Machine Drawing	0	0	3	2
13.	03IPE301	Discipline & Co curricular Activities	0	0	4	1
		Total	18	0	19	28

SEMESTER IV

S. No.	Code No.	Subject	Teaching Periods			Credit Points
			P	T	P	
1.	04IPE101	DESIGN OF MACHINE ELEMENTS I	3	0	0	3
2.	04IPE102	AUTOMOBILE ENGINEERING	3	0	0	3
3.	04IPE103	FLUID MECHANICS	3	1	0	4
4.	04IPE104	MACHINING&M/C TOOLS	3	0	0	3
5.	04IPE105	KINEMATICS OF M/C	3	1	0	4
6.	04IPE106	MECHANICAL MEASUREMENT & CONTROL	3	0	0	3
1.	04IPE201	DYNAMICS OF MACHINES ELEMENT LAB I	0	0	2	1
2.	04IPE202	FLUID MECHANICS LAB	0	0	2	1
3.	04IPE203	THERMAL ENGINEERING LAB	0	0	3	2
4.	04IPE204	MECHANICAL MEASUREMENTS & CONTROL	0		2	1
5.	04IPE205	MACHINE DESIGN LAB I	0	0	3	2
13.	04IPE301	DISCIPLINE & CO CURRICULAR ACTIVITIES	0	0	4	1
		Total	18	2	16	28

SEMESTER V

S. No.	Code No.	Subject	Teaching Periods			Credit Points
			P	T	. P	
1.	05IPE101	ADVANCED MECHANICS OF SOLID	3	1	0	4
2.	05ME102	DYNAMICS OF MACHINE	3	1	0	4
3.	05ME103	FUNDAMENTAL OF AERODYNAMICS	3	0	0	3
4.	05IPE104	HEAT AND MASS TRANSFER	3	0	0	3
5.	05IPE105	INDUSTRIAL ENGINEERING I	3	0	0	3
6.	05IPE106	PRINCIPLE OF TURBO MACHINE	3	0	0	3
1.	05IPE201	PRODUCTION ENGG. LAB I	0	0	3	2
2.	05IPE202	AUTOMOBILE ENGG LAB	0	0	3	2
3.	05IPE203	DYNAMICS OF MACHINES LAB II	0	0	3	2
4.	05IPE204	MAT LAB &COMPUTER GRAPHICS	0	0	3	2
5.	05IPE301	DISCIPLINE & CO CURRICULAR ACTIVITIES	0	0	4	1
		Total	18	2	16	29

SEMESTER VI

S. No.	Code No.	Subject	Teaching Periods			Credit Points
			P	T	. P	
1.	06IPE101	DESIGN OF MACHINE ELEMENTS–II	3	1	0	4
2.	06IPE102	MANUFACTURING SCIENCE & TECHNOLOGY	3	1	0	4
3.	06IPE103	NOISE VIBRATION & HARSHNESS	3	1	0	4
4.	06IPE104	I.C ENGINE & DIESEL POWER PLANT	3	0	0	3
5.	06IPE105	HYDRAULIC MACHINE &HYDROELECTRIC POWER PLANT	3	0	0	3
6.	06IPE106	NUMERICAL METHODS & APPLIED STATISTICS'	3	0	0	3
1.	06IPE201	MACHINE DESIGN LAB II	0	0	3	2
2.	06IPE202	HEAT & MASS TRANSFER LAB	0	0	3	2
3.	06BIPE203	TURBO MACHINERY LAB	0	0	2	1
4.	06IPE204	COMPUTER ORIENTED NUMERICAL METHODS LAB	0	0	3	2
5.	06IPE301	DISCIPLINE & CO CURRICULAR ACTIVITIES	0	0	4	1
		Total	18	3	15	29

SEMESTER VII

S. No.	Code No.	Subject	Teaching Periods			Credit Points
			L	T	P	
1.	07IPE101	COMPUTER AIDED DESIGN	3	0	0	3
2.	07IPE102	REFRIGERATION &AIR CONDITIONING	3	0	0	3
3.	07IPE103	OPERATION RESEARCH	3	0	0	3
4.	07IPE104	STEAM TURBINES &STEAM POWER PLANT	3	0	0	3
5.	07IPE105	PRODUCT DEVELOPMENT & LAUNCHING	3	0	0	3
6.	07IPE106	MECHATRONIC	3	0	0	3
7.	07IPE107	METAL CASTING	3	0	0	3
8.	07IPE108	METAL CUTTING	3	0	0	3
10.	07IPE201	P.E LAB-II	0	0	2	1
11.	07IPE202	MECHANICAL VIBRATION LAB	0	0	2	1.
12	07IPE203	I.C ENGINE LAB	0	0	2	1.
13	09IPE204	PRACTICAL TRAINING & INDUSTRIAL VISIT	0	0	2	1
14.	07IPE301	DISCIPLINE & EXTRA CURRICULAR ACTIVITIES	0	0	4	1
			24	0	12	29

SEMESTER VIII

S. No.	Code No.	Subject	Teaching Periods			Credit Points
			L	T	P	
1.	08IPE101	RENEWABLE ENERGY TECHNOLOGY	3	1	0	4
2.	08IPE102	OPERATIONS MANAGEMENT	3	1	0	4
3.	08IPE103	GAS TURBINE & GAS POWER PLANT	3	1	0	4
5.	08IPE104	NON CONVENTIONAL MACHINING PROCESSES	3	0	0	3
6.	08IPE105	JIG, FIXTURES & DIE DESIGN	3	1	0	4
	08ME106	COMPUTER AIDED DESIGN & MANUFACTURING	3	1	0	4
	08IPE107	ELECTIVE –II I- RELIABILITY & MAINTENCE ENGG. II- COMPUTATIONAL FLUID FLOW & HEAT TRNSFER III- FINITE ELEMENT METHODS	3	0	0	3
7.	08IPE201	CAD LAB (PRO E/UNIGRAPHICS/AUTO CAD INVENTOR)	0	0	2	1
8.	08IPE202	CAM & ROBOTICS LAB	0	0	2	1
9.	08IPE203	INDUSTRIAL ENGG. LAB	0	0	2	1
10.	08IPE301	DISCIPLINE & EXTRA CURRICULAR ACTIVITIES	0	0	4	1
		Total	21	5	10	30

SEMESTER IX

S. No.	Code No.	Subject	Teaching Periods			Credit Points
			L	T	P	
1.	09IPE101	METAL FORMI**NG**	3	1	0	4
2.	09IPE102	MACHINE TOOL DESI**GN**	3	1	0	4
3.	09IPE103	CUTTING TOOL DESI**GN**	3	1	0	4
4.	09IPE104	PRODUCT DESIGN & DEVELOPMENT	3	1	0	4
6.	09IPE105	MANAGEMENT OF PRODUCTION SYS**TEMS**	3	1	0	4
7	09IPE106	ELECTIVE (ANY ONE) METHODS ENGINEERING & ERGONOMICS ENTREPRENEURSHIP STATISTICS & RELIABILITY ENGINEERING	3	0	0	3
8	09IPE201	PROJECT WORK	0	0	4	2
9	09IPE202	SEMINAR	0	0	3	2
10	09IPE301	DISCIPLINE & EXTRA CURRICULAR ACTIVITIES	0	0	4	1
		TOTAL	18	5	13	28

SEMESTER X

Subject code	Name of Subject	TEACHING PERIODS			Credit Points
		L	T	P	
10 IPE 201	DISSERTATION a) Continuous Evaluation b) Project Report c) Viva Voice	 5 6 6	 0	 0	 5 6 6
10 IPE 301	DISCIPLINE & EXTRA CURRICULAR ACTIVITIES	0	0	4	1
	TOTAL	17		4	18

SEMESTER III

MECHANICS OF SOLID

Course/Paper 03IPE 101
IPE semester III

Unit – 1

Stress & strain: Tension, compression, shearing stress & strain; Poisson's ratio: Stress-strain Relationship, Hooke's law; equations of static = w for 2D & 3D cars Elastic constants and their relations for a isotropic hookean material, anisotropy & orthotropic, thermal stresses, composite bars; simple Elastic, plastic & visco-elastic behavior of common materials in tension and compression test, stress- strain curves. Concept of factor of safety & permissible stress. Conditions for equilibrium. Concept of free body diagram; Introduction to mechanics of deformable bodies.

Unit – 2

Members subjected to flexural loads: Theory of simple bending, bending moment and shear force diagrams for different types of static loading and support conditions on beams. Bending stresses, Section modulus and transverse shear stress distribution in circular, hollow circular, I, Box, T, angle sections etc.

Unit – 3

Principal planes, stresses & strains: Members subjected to combined axial, bending & Torsional loads, maximum normal & shear stresses; Concept of equivalent bending & equivalent twisting moments: Mohr's circle of stress & strain. Theories of Elastic Failures: The necessity for a theory, different theories, significance and comparison, applications.

Unit – 4

Torsion: Torsional shear stress in solid, hollow and stepped circular shafts, angular deflection and power transmission capacity. Stability of equilibrium: Instability & elastic stability. Long & short columns, ideal strut, Euler's formula for crippling load for columns of different ends, concept of equivalent length, eccentric loading, Rankine formulae and other empirical relations.

Unit – 5

Transverse deflection of beams: Relation between deflection, bending moment, shear force and load, Transverse deflection of beams and shaft under static loading, area moment method, direct integration method: method of superposition and conjugate beam method. Variational approach to determine deflection and stresses in beam. Elastic strain energy: Strain energy due to axial, bending and Torsional loads; stresses due to suddenly applied loads; use of energy theorems to determine deflections of beams and twist of shafts. Castigliano's theorem. Maxwell's theorem of reciprocal deflections

Reference

1. MECHANICS OF SOLID: S. H CRANDALL, N.C DAHI & T.J LARDNER. MCGRAW HILL INTERNATIONAL EDITION.
2. STRENGTH OF MATERIALS: G.H RYDER. ELBS PUBLICATIONS CO., LONDON
3. ELEMENTS OF STRENGTH OF MATERIALS. J.P TINNOSHNKO & G.H YOUNG, AFFILIATED EAST WEST PRESS, NEW DELHI
4. SOLID MECHANICS. G.M.A KAZMI. TATA MCGRAW HILL PUBLISHING CO. LTD.. NEW DELHI
5. STRENGTH OF MATERIALS: S. RAMAMRUTHAM. DHANPAT RAI AND PUBLICATIONS, NEW DELHI

MATERIAL SCIENCE AND ENGG.

Course/Paper 03IPE 102
IPE semester III

UNIT 1

Atomic structure of Metals: Crystal structure, crystal lattice of (i) Body centred cubic (ii) Face centred cubic (iii) Closed packed hexagonal, crystallographic Notation of atomic planes and Directions (Miller Indices), polymorphism and allotropy, Crystal imperfection.

UNIT 2

Theories of plastic deformation. Phenomenon of slip, twinning and dislocation. Identification of crystallographic possible slip planes and direction in FCC, BCC, HCP. Recovery and recrystallization, preferred orientation causes and effects on the property of metals.

UNIT3

Classification of engineering materials. Solidification of metals and of some typical alloys: Mechanism of crystallization (I) nuclear formation (ii) crystal growth. General principles of phase transformation in alloys, phase rule and equilibrium diagrams, Equilibrium diagram of binary system having complete Mutual solubility in liquid state and limited solubility in solid state, Binary isomorphism alloy system, Hume-Rothery rule, Binary system with limited solid solubility of terminal phase and in which solubility decreases with temperature and also alloy with a peristaltic transformation. Equilibrium diagram of a system whose components are subject to allotropic change. Iron carbon Equilibrium diagram, phase transformation in the iron carbon diagram (I) Formation of Austenite (ii) Transformation of Austenite into partite (iii) Marten site transformation in steel, TTT curves.

UNIT 4

Engineering properties and their measurements. Principles and applications of annealing, normalizing, hardening, tempering. Recovery and recrystallization. Harden ability - its measures, variables, effecting Harden ability, methods, for determination of Harden ability. Over-heated and Burnt steel, its causes and remedies. Temper brittleness - its causes and remedies. Basic principles involved in heat treatment of plain carbon steel, alloy steels, cast iron and Non-ferrous metals and their alloys. Chemical Heat treatment of steels: Physical principles involved in chemical heat treatment procedure for carburizing, Nitrating, Cyaniding, carbo-nitriding of steel.

UNIT 5

Effects produced by Alloying element on the structures and properties of steel Distribution of alloying Elements (Si, Mn, Ni, Cr, Mo, Co, Wr, Ti, Al) in steel, structural classes of steel. Classification of steels, BIS Standards. Fibre reinforced plastic composites**:** Various fibres and matrix materials, basic Composite manufacturing methods, applications of composite materials.

Reference

:

1. MATERIAL SCIENCE & ENGINEERING BY V. RAGHAVAN. PUB PHI
2. ENGINEERING MATERIALS BY B. K. AGARWAL. PUB. TMH
3. MATERIAL SCIENCE & PROCESS BY S.K. HAZRA: CHOWDHARY , MEDIA PROMOTERS & PUBLICATIONS PVT. LTD. BOMBAY
4. ENGG. METALLURGY. PART – I BY RAYMOND A. HIGGINS. ELBS
5. HEAT TREATMENT PRINCIPLES AND TECHNOLOGIES BY T.V RAJAN, O.P. SHARMA & ASHOK SHARMA

ENGG. THERMODYNAMICS

Course/Paper 03IPE 103
IPE semester III

UNIT 1

Basic Concepts of Thermodynamics :Thermodynamics system, control volume, Properties, state, processes and cycle, equality of temperature, Zeroth Law of thermodynamics, temperature scale, laws of perfect gas, Pure substances, vapour-Liquid –solid-phase equibrium in a pure substances, thermodynamic surfaces

UNIT 2

Work and heat, Law of conservation of mass and energy, First law of thermodynamics, steady state Processes, Second law of thermodynamics, Heat engine, Carnot cycle, thermodynamic temperature scale, entropy, change of entropy for different processes, equivalence of Kelvin plank and clausius statements, clausius inequality.

UNIT 3

Available and unavailable energy, availability of a non flow and steady flow system, Helmbeltz and Gibb's functions, Thermodynamic Relations: Important mathematical relations, Maxwell relations, Tds Relations, Joule- Thomson coefficient, Clayperon relation.

UNIT 4

Air – standard power cycle, Brayton cycle, Otto cycle, diesel cycle, Dual cycle, Stirling cycle, Ericssion cycle and Atkinson cycle, Mean effective pressure and efficiencies, Four stroke petrol and diesel engine, Two stroke Petrol and diesel engine.

UNIT 5
13/06/2007 13:38:00 #bharat# 5
Properties of steam, phase change process, use of steam table & molier char. Rankine cycle, Reheat cycle, Regenerative cycle, cogeneration vapour compression refrigeration cycle.

Reference

1. ENGINEERING THERMODYNAMICS, P.K NAG TATA MCGRAW HILLS
2. ENGINEERING THERMODYNAMICS, C.P GUPTA, RAJENDRA PRAKASH NEMI CHAND & BROS.
3. ENGINEERING THERMODYNAMICS, R.S KHURMI, J.K GUPTA PUBLISHER S. CHAND
4. PRINCIPLES OF THERMAL ENGG., NARMAN E. HARRIS, TATA MCGRAW HILL.

MANUFACTURING PROCESS

Course/Paper 03IPE 104
IPE semester III

UNIT 1
Importance of manufacturing, economic and technological definition of manufacturing, survey of manufacturing processes.
Foundry Technology: Patterns practices: Types of patterns, allowances and material used for patterns, moulding materials, moulding sands, Moulding sands; properties and sand testing; grain fineness; moisture content, clay content and permeability test, core materials and core making, core print; core boxes, chaplets, gating system design. Moulding practices**:** Green, dry and loam sand moulding, pit and floor moulding; shell moulding; permanent moulding; carbon dioxide moulding.
Casting practices: Fundamental of metal casting, sand casting, Shell-Mould casting, mold casting
(plaster and ceramic), investment casting, vacuum casting, Permanent mould casting, slush casting,
pressure casting, die casting, centrifugal casting, continuous casting, squeeze casting, casting alloys,
casting defects, design of casting, gating system design, and riser design. Melting furnaces- rotary, pit
electric, tilting and cupola.

UNIT 2
Metal Joining Processes: Principle of welding, soldering, brazing and adhesive bonding. Survey of welding and allied processes. Arc welding: power sources and consumables. Gas welding and cutting: Processes and equipments. Resistance welding: principle and equipments. Spot, projection and seam welding process. Atomic hydrogen, ultrasonic, plasma and laser beam welding, electron beam welding, and special welding processes e.g. TIG, MIG, friction and explosive welding, welding of C.I. and Al, welding defects. Electrodes and Electrode Coatings

UNIT 3
Forming and Shaping Processes: Metal working, elastic and plastic deformation, concept of strain hardening, hot and cold working, rolling, principle and operations, roll pass sequence, forging, forging operations, extrusion, wire and tube drawing processes. Forging: Method of forging, forging hammers and presses, principle of forging tool design, cold working processes- Shearing, drawing, squeezing, blanking, piercing, deep drawing, coining and embossing, metal working defects, cold heading, riveting, thread rolling bending and forming operation.

UNIT 4

Powder Metallurgy: Powder manufacturing, mechanical pulverization, sintering, Electrolytic Process, chemical reduction, atomization, properties of metal powders, compacting of powders sintering, advantages and applications of P/M.
Rapid Prototyping Operations: Introduction, subtractive processes, additive processes, Virtual Prototyping and applications

UNIT 5
Plastic Technology: Introduction, Classification of Plastics, Ingredients of Moulding compounds, General Properties of Plastics, Plastic part manufacturing processes such as compression moulding, transfer moulding, injection moulding, extrusion moulding, blow moulding, calendaring, thermoforming, slush moulding, laminating

Reference

1. PRODUCTION TECHNOLOGIES BY P.C SHARMA BY S.CHAND AND CO. LTD.
2. MANUFACTURING PROCESS BY BEGEMAN
3. MANUFACTURING PROCESSES AND MATERIAL: I. E DOYLE, CARL KAYSER, SCHRADE LEECH.
4. MANUFACTURING PROCESS. SCHEY
5. PRODUCTION TECHNOLOGIES: ASHISH DUTT SHARMA, CBC

OBJECT ORIENTED PROGRAMMING IN C++

Course/Paper 03IPE 105
IPE semester III

UNIT 1
Introduction to Object Oriented Programming: Basic concepts: Class, Object, Method, Message passing, Inheritance, Encapsulation, Abstraction, Polymorphism.

UNIT 2
Basics of C++ Environment: Variables; Operators; Functions; user defined, passing by reference, passing an array to the function, inline function, scope, overloading; Pointers: objects and lvalue, arrays and pointers, the new and delete operators, dynamic arrays, arrays of pointers and pointers to arrays, pointers to pointers and functions; Strings: String I/O, character functions in ctype.h, string functions in string.h.

UNIT3
Object oriented concepts using C++: Classes: Member functions, Friend functions, Constructors, Access functions, Private member functions, class destructor, static data and function members; Overloading: inline functions, this operator, overloading various types of operators, conversion operators; the String Class; Composition and Inheritance: Hierarchy and types of inheritance, protected class members, private versus protected access, virtual functions and polymorphism, virtual destructors, abstract base classes.

UNIT 4
Templates and Iterators: function and class templates, container classes, subclass templates, iterator classes; Libraries: standard C++ library, contents of a standard C headers, string streams, file processing: Files and streams classes, text files, binary files, classification of files, the standard template library.

UNIT 5
Data Structures Using C++: Linked lists – Singly linked list, Doubly linked lists, Circular lists, Stacks and Queues priority Queues, Stacks, Queues.

Reference

1. PROGRAMMING IN C: C. GOTTFRIED, SCHAUM SERIES.
2. PROGRAMMING IN C: E. BALAGRUSWAMY.
3. OBJECT ORIENTED PROGRAMMING IN C++: E. BALAGRUSWAMY

ADVANCE ENGINEERING MATHEMATICS

Course/Paper 03IPE 106
IPE semester III

UNIT 1
Fourier series: Fourier series, Half-range series, Harmonic analysis.
Integral Transforms: Fourier integral theorem, Fourier transforms, Convolution theorems, Inversion theorem for Fourier and Laplace transforms, Simple applications of these transforms to onedIPEnsional problems.

UNIT 2
Method of separation of variables - applications to the solution of wave equation in one dIPEnsion, laplace's equation in two dIPEnsions, Diffusion equation in one dIPEnsion.
Transform calculus : Laplace transform with its simple properties, applications to the solutions of ordinary and partial differential equations having constant co-efficient with special reference to wave and diffusion equation.

UNIT 3
Complex Variable: Functions of a complex variable; Exponential, trigonometric, hyperbolic and logarithmic functions; Differentiation, Analytic functions, Cauchy-Riemann equations, conjugate functions; Application to two dIPEnsional potential problems; Conformal transformations, Schwartz- Christoffel transformation; Cauchy's Integral theorem. Taylor's and Laurent's expansions; Branch
points, zeros, poles and residues; Simple problems on contour integration

UNIT 4
13/06/2007 13:38:00 #bharat# 7
Boundary Value Problems: Equations for vibrations of strings, heat flow and electrical transmission lines; Laplace's equation in Cartesian, cylindrical polar and spherical polar coordinates; Solution by separation of variables. Solution in Series: Differentiation and integration of infinite series, Series solution of differential equations; Bessel and Legendre equations, their series solution, elementary properties of Bessel functions and Legendre polynomials

UNIT 5
Numerical Methods: Difference operators: forward, backward, central shift and average operators and relations between them. Newton Backward and Interpolation; Lagrange's interpolation and the error formula for interpolation. Numerical differentiation and integration. Trapezoidal rule and Simpson's one-third rule including error formula.

Reference
1. MATHEMATICS STATISTICS BY J. N KAPUR & H.C SAXENA, S. CHAND & CO., NEW DELHI
2. MATHEMATICAL STATISTICS, M RAY & H.S. SHARMA, RAM PRASAD & SONS , AGRA
3. MATHEMATICAL STATISTICS, JOHN E. FREUND, PRENTICE HALL OF INDIA, NEW DELHI
4. ADVANCED MATHEMATICS FOR ENGINEERS, CHANDRIKA PRASAD, PRASAD MUDRANALAYA

STRENGTH OF MATERIALS LAB

Course/Paper 03IPE 201
IPE semester III
1. Izod Impact testing.
2. Rockwell Hardness Testing.

3. Spring Testing
4. Column Testing for buckling
5. Torsion Testing
6. Tensile Testing
7. Compression Testing
8. Shear Testing
9. Brinell Hardness Testing
10. Bending Test on UTM.
11. Study of Fatigue Testing Machine.

MATERIAL SCIENCE AND HEAT TREATMENT LAB

Course/Paper 03IPE 202
IPE semester III

1. Study of Engineering Materials and crystals structures. Study of models BCC, FCC, HCP and stacking sequence, tetrahedral and octahedral voids.
2. To calculate the effective number of atoms, co-ordination number, packing factors, c/a ratio for HCP structure.
3. Study of brittle and ductile fracture.
4. To prepare metallic samples for metallographic examination and to study the principle and construction of the Metallurgical Microscope.
5. Study of the following Micro structures: Hypo, Hyper and Eutectoid Steel, Grey, White, Nodular and Malleable Cast Iron.
6. Annealing of Steel - Effect of annealing temperatures and tIPE on hardness.
7. Study of Microstructure and hardness of steel at different rates of cooling. Microstructure examination of white cast iron.
8. Hardening of steel, effect of quenching medium on hardness.
9. Effect of Carbon percentage on the hardness of Steel.
10. Study of various crystal structures and dislocations through models.
11. Study of Iron-Carbon Equilibrium Diagram and sketch the various structures present at room temperature.

THERMAL ENGINEERING LAB 1

Course/Paper 03IPE 203
IPE semester III

1. Comparative study of four stroke diesel and petrol engines.
2. Comparative study of two stroke petrol and diesel engines.
3. Studies of fuel supply systems of diesel and petrol engines.
4. Study of cooling, lubrication and ignition system in diesel and petrol engines.
13/06/2007 13:38:00 #bharat# 8
5. To study various types of Boilers and to study Boiler mounting and accessories.
6. To study various types of Dynamometers.
7. To study Multi Stage Air Compressors.
8. To find the BHP, Thermal efficiency of four stroke diesel engine.
9. Study of Brakes, Clutches, and Transmission System.
10. To prepare a comparison sheet of various automobiles (4 Wheeler and 2 Wheeler).

PRODUCTION PRACTICE I

Course/Paper 03IPE 204
IPE semester III

1. Study of lathe machine, lathe tools cutting speed, feed and depth of cut.
2. To perform step turning, knurling and chamfering on lathe machine as per drawing.
3. Taper turning by tailstock offset method as per drawing.

4. To cut metric thread as per drawing.
5. To perform square threading, drilling and taper turning by compound rest as per drawing.
6. To study shaper machine, its mechanism and calculate quick return ratio.

Foundry Shop

1. To prepare mould of a given pattern requiring core and to cast it in aluminium.
2. Moisture test and clay content test.
3. Strength Test (compressive, Tensile, Shear Transverse etc. in green and dry conditions) and Hardness Test (Mould and Core).
4. Permeability Test.
5. A.F.S. Sieve analysis Test.

COMPUTER PROGRAMMING LAB I

Course/Paper 03IPE 205
IPE semester III
List of programs in C:

1. Program for revising control statements, arrays and functions.
2. Program using string handling and various functions described in string.h, ctype.h.
3. Program using structures and sorting algorithm (Insertion, Selection, Quick, Heap sort) and functions described in math.h.
4. Program using file handling and related functions defined in stdio.h, io.h.
5. Program using pointers, array and pointers, pointers to structures, dynamic memory allocation.

List of Programs in C++

6. Program using basic I/O and control statements.
7. Program using class, objects, objects as function parameters.
8. Program using functions and passing reference to a function, inline functions. Program using Inheritance and virtual base class.
9. Program using pointers, arrays, dynamic arrays. Program using functions defined in ctype.h and string.h.
10. Program using constructors, destructors. Program using function and operator over loading List of program in C++ implementing Data Structures
11. Creating and managing (add, delete, print, insert) nodes of a Linked list.
12. Creating and managing (create, pop, push etc.) stacks and queues.

Note: Students should submit and present a minor project at the end of the lab.

MACHINE DRAWING

Course/Paper 03IPE 206
IPE semester III

Detail drawings:
Couplings: Pin-type flexible coupling etc,
IC. Engine parts: connecting rod, crank shaft, etc,
Boiler Mountings: Steam stop valve/ feed check-valve/ safety valve /three way stop valve blow offcock.
Bearings: Swivel bearing
Machine Tool Parts: Shaper tool head, Lathe Tail Stock, Turret Tool Post, Turret Bar feeding Mechanism / Universal Dividing Head, Swivel machine vice.
Miscellaneous: Screw jack and drill-press vice.
Free Hand Sketches: Pipes and Pipe fittings, clutches, bearings, bearing puller, valve gear mechanisms, machine arbor and cutter, universal dividing head, jigs and fixtures, Step less drive , sliding gear box.

SEMESTER IV

DESIGN OF MACHINE ELEMENTS

Course/Paper 04IPE 101
IPE semester IV

UNIT - 1
Materials: Properties and IS coding of various materials, Selection of material from properties and economic aspects. Manufacturing aspects in Design : Selection of manufacturing processes on the basis of design and economy, Influence of rate of production, standard size, Influence of limits, fits tolerances and surface finish. Change in the shape of the designed element to facilitate its production, Design of castings, working drawing.

UNIT - 2
Design for strength: Allowable stresses, detailed discussion on factor of safety (factor of ignorance): Stress concentration. Causes & mitigation. Introduction of various design considerations like strength, stiffness, weight, cost, space etc. Concept of fatigue failures. Design of machine elements subjected to direct stress, Pin, cotter and keyed joints, Design of screw fastening.

UNIT - 3
Design of members in Bending: Beams, levers and laminated springs.

UNIT - 4
Design of members in torsion : Shafts and shaft couplings.

UNIT - 5
Design of shafts, brackets under combined stresses, Calculation of transverse & torsional Deflections. Screw fasteners subjected to eccentric loading.

Reference

1. ELEMENTS OF MACHINE DESIGN: N.C PANDEY, C.S SHAH CHAROTAR BOOK STALL AND
2. DESIGN OF MACHINE ELEMENT: V. B BHANDARI TATA MCGRAW HILL PUB CO. LTD.
3. MECHANICAL MACHINE DESIGN: R.C BAHL, V.K GOEL, STANDARD PUB. DISTRIBUTERS DELHI.
4. MECHANICAL ENGINEERING DESIGN: J.E SHIGLEY MCGRAW HILL CO.
5. MACHINE DESIGN : K K PUJARA, B I JUNEGA, DHANPAT RAI PUBLICATIONS.

AUTOMOBILE ENGINEERING

Course/Paper 04IPE 102
IPE semester IV

UNIT - 1
FRAME & BODY: Layout of chassis, types of chassis frames and bodies, their constructional features and materials. TRANSMISSION SYSTEM**:** Clutch; single plate, multiplate, cone clutch, semi centrifugal, electromagnetic, vacuum and hydrautic clutches. Fluid coupling.

UNIT - 2
Gear boxes, Sliding mesh, constant mesh, synchromesh and epicyclic gear boxes, Automatic transmission sytem; Hydraulic torque converter; overdrive, propeller shaft, universal joints, front wheel drive, differential; Rear axle drives. Hotchkiss and torque tube drives; rear axle types; Two wheel and four wheel drive.
13/06/2007 13:38:00 #bharat# 11

UNIT - 3
RUNNING GEAR: Types or wheels and tyres. Tyre construction; tyre inflation pressure, tyre wear and their causes; re-treading of the tyre, Steering system, steering gear boxes, Steering

linkages, steering mechanism, under and over steering. Steering Geometry, effect of camber, caster, king pin inclination, toe in and toe out; power steering; integral and linkage types suspension system; objects and requirements, suspension spring, front and rear suspension systems, Independent suspension system shock absorber. BRAKES ; Classification and function; Mechanical, hydraulic, vacuum air and self engineering brakes; Brake shoes and lining materials.

UNIT - 4

AUTOMOTIVE ELECTRICAL SYSTEM: Battery construction, Charging and testing, battery types,

Starting and Battery Charging System : Starter motor construction, types of drive, Alternator construction, regulation and rectification.

Ignition System : magneto and coil ignition systems, System components and requirements, Automotive lighting : Wiring systems Electrical instruments; head lamp, electric horn, fuel level indicator.

UNIT - 5

AUTOMOTIVE AIR CONDITIONING: Introduction, Loads, Air conditioning system Components, Refrigerants, Fault Diagnosis. AUTOMOTIVE SAFETY: Safety requirements, Safety Devices, Air bags, belts, radio ranging, NVS (Night Vision System) GPS (Global Positioning System) etc.

Reference

1. AUTOMOBILE ENGINEERING BY R K SHARMA
2. AUTOMOBILE ENGINEERING BY KIRPAL SINGH
3. VEHICAL ENGINE AND TECHNOLOGY BY HEISLER ELBS
4. AUTOMATIC TRANSMISSION BY MATHIAS F. BREJCHA, PRENTICE HALL
5. AUTO MECHANICS WEBSTER J. GLENWNE PUBLISHING CO.

FLUID MECHANICS

Course/Paper 04IPE 103
IPE semester IV

UNIT - 1

Basic Definitions and Fluid Properties ; Definition of Fluid, Incompressible and compressible fluids, Fluid as a continuum, Mass, Density, specific weight, relative density, specific volume, Bulk modulus, velocity of sound Ideal fluid Viscosity. Newtonian and Non - Newtonian fluid, Kinematic viscosity, Effect of temperature and pressure on viscosity, surface tension capillarity, vapour pressure and cavitation. Fluid Statics : General differential equation, Hydrostatics Manometry, Fluid forces on submerged surfaces. Curved surfaces, Aerostatics, Isothermal atmosphere, polytropic atmosphere. The international standard atmosphere, static stability The international standard atmosphere submerged bodies. Floating bodies.

UNIT - 2

Kinematics and conservation of Mass : Flow classifications. Fluid velocity and acceleration, streamlines and the stream function. Pathlines and streak lines. Deformation of a fluid element, verticity and circulation. Irrotational and Rotational flow. Flownet, Laplace equation. Conservation of mass and the continuity equation for three dIPEnsions.

Fluid Momentum : The Momentum theorem Applications of the momentum theorem Equation of motion, Euler's equation of motion Integration of Euler's equation of motion.

13/06/2007 13:38:00 #bharat# 12

Bernoulli's equation. Applications of Bernoulli's Pitot tube, Equation of motion for Viscous fluid, Navier Stoke's equation.

UNIT - 3

Orifice discharging free, Jet, vena contracts, co-efficient of contraction, velocity and discharge, coefficient of resistance. Orifices and mouthpieces Nozzles and weires.

Flow Through Pipes : Reynold's experIPEnt Darcy's Weisback equation. Loss of head due to sudden enlargements, contraction, entrance, exit obstruction, bend, pipe fittings. Total and Hydraulic grandient lines, Flow through pipe line. Pipes in series, parallel Transmission of

power through pipes.

UNIT - 4
Laminar Flow: Simple solution of Navier Stokes equations. Hagen – Poiseuille flow. Plans Poiseuille flow and coutte flow. Turbulent Flow; Variation of friction factor with Reynold's number. The Prandt Mixing length hypothesis applied to pipe flow, velocity distribution in smooth pipes, sough pipes. The Universal pipe friction laws, Colebrook. White formula. DIPEnsional Analysis: Buckingham variables, Model Similitude, Force ratio, Reynolds, Froude's Mach, Weber and Euler numbers and their applications. Undistorted model distorted model scale effect.

UNIT - 5
The Boundary Layer: Description of the boundary layer. Boundary Layer thickness boundary layer separation and control. The Prandtl boundary layer equation. Solution for cominar boundary layer. The momentum equation for the boundary layer. The flat plate in uniform free stream with no pressures gradients. Approximate momentum analysis laminar boundary Aerofoils Theory. Flow round a body ; Drag skin friction drag, pressure drag, combined skin friction & pressure drag (Profile drag) wave drag, lift induced drag. Flow past sphere & Cylinder.

Reference

1. ENGINEERING FLUUID MECHANICS: K L KUMAR, EURESIA PUBLISHING HOUSE
2. FLUID MECHANICS AND MACHINES: F M WHITE, JOHN WILLY AND SONS
3. FLUID MECHANICS : R.K.RAJPUT S. CHAND COMPANY LTD
4. FLUID MECHANICS VM STREETER MCGRAW HILL
5. ENGINEERING FLUID MECHANICS BY D S KUMAR

MACHINING AND MACHINE TOOLS

Course/Paper 04IPE 104
IPE semester IV

UNIT 1
Classification of metal removal process and machines
Mechanics of metal cutting: Geometry of single point cutting tool and tool angles. Tool nomenclature in ASA, ORS, NRS and interrelationship. Mechanism of chip formation and types of chips, chip breakers. Orthogonal and oblique cutting, cutting forces and power required, theories of metal cutting. Thermal aspects of machining and measurement of chip tool interface temperature. Friction in metal cutting.
13/06/2007 13:38:00 #bharat# 13

UNIT 2
Machinability: Concept and evaluation of machinability, tool life, mechanisms of tool failure, tool life and cutting parameters, machinability index, factors affecting machinability. Cutting fluids: Types, properties, selection and application methods
General Purpose Machine Tools: Classification and constructional details of lathe, drilling, milling, shaping and planning machines. Tooling, attachments and operations performed, selection of cutting parameters, calculation of forces and tIPE for machining. Broaching operation.

UNIT 3
Special Purpose Machine Tools: Automatic lathes, capstan and turret lathe machines. Swiss automatic, operational planning and turret tool layout, sequence of operations. Tracer attachment in Machine Tools: mechanical-copying machines; Hydraulic Tracing Devices; Electric Tracing systems; Automatic tracing.
Abrasive processes: Abrasives; natural and synthetic, manufacturing, nomenclature. Selection of grinding wheels, wheel mounting and dressing, characteristic terms used in grinding. Machines for surface and cylindrical grinding, their constructional details and processes. Surface finishing: Honing, lapping, superfinishing, polishing and buffing processes.

UNIT 4

Thread Manufacturing: casting; thread chasing; thread cutting on lathe; thread rolling, die threading and tapping; thread milling; thread grinding.

Gear Manufacturing Processes: hot rolling; stamping; powder metallurgy; extruding etc. Gear generating processes: gear hobbling, gear shaping. Gear finishing processes: shaving, grinding, lapping, shot blasting, phosphate coating, Gear testing.

UNIT 5

High Velocity Forming Methods: (High-energy rate forming processes) Definition; Hydraulic forming, Explosive forming, Electro-hydraulic forming, Magnetic pulse forming.

Industrial Safety: Human factor in machine equipment safety; reducing industrial noise; precautions to be taken by operators for safe working on different machine tools.

Reference

1. PRODUCTOIN ENGINEERING SCIENCES BY PC PANDEY & C K SINGH STD PUB & DIST.
2. PRODUCTION ENGINEERING BY P C SHARMA BY S CHAND & CO.
3. IFUNDAMENTALS OF TOOL DESIGN: F W WILSON

KINEMATICS OF MACHINES

Course/Paper 04IPE 105
IPE semester IV

UNIT - 1

Kinematics: Elements, pairs , mechanisms, four bar chain and its inversions, velocity and acceleration, Klein's construction, coriolis component, instantaneous center method, synthesis

UNIT - 2

Automotive vehicle mechanisms: Overhead valve mechanism, Davis and Ackerman steering mechanism, Trifler suspension and Hookes joint.

Power transmission: Belts and ropes, effect of centrifugal force, creep, chain drive

UNIT - 3

Friction: Laws of static, dynamic and rolling friction, dry and viscous friction, inclined plane and screw jack, ,pivots and friction axis, bearing, Clutches. Theory of film lubrication.

UNIT - 4

Brakes and dynamometers: Band, block and band & block brakes, braking action, absorption and transmission type dynamometers, prony, rope and hydraulic dynamometers braking system of automobiles.

UNIT - 5

Cams: Type of cams, displacement, velocity and acceleration curves for different cam followers, consideration of pressure angle and wear, analysis of motion of followers for cams with specified contours.

Reference

1. KINETICS & DYNAMICS OF MACHINES : G.H.MARTIN M CGRAWHILL PUBLISHING CO LTD
2. ELEMENTS OF M/C DESIGN: N.C. PANDYA & C.S SHAH CHAROTAR BOOK STALL ANAND
3. DESIGN OF M/C ELEMENTS: V.B. BHANDARI,TATA MC-GRAW HILL PUBLISHING LTD.,NEW DELHI M CGRAWHILL PUBLISHING CO LTD
4. MECHANICAL ENGG DESIGN : J.E. SHIGLEY, M C GRAW HILL PUBLISHING CO LTD
5. FUNDAMENTAL OF MACHINE COMPONENT DESIGN : R.C.JUVINALL&K.M. MARSHEK,JOHN VILAY & SONS
6. THEORY & PROBLMS OF MACHINE DESIGN ,HALTETSCHAUM"S OUTLINE SERIES, M CGRAWHILL PUBLISHING CO LTD
7. "DESIGN DATA" PSG COLLEGE OF TECHNOLOGY/S DPV PRINTERS
8. MACHINE DESIGN ,RAJENDRA KARVA

MECHANICAL MEASURMENTS & CONTROL

Course/Paper 04IPE 106

IPE semester IV

UNIT - 1
System configuration, basic characteristic, calibration, classification and performance characteristics of a instrumentation system, Specification and testing of dynamic response. Strain Measurement : Electric Strain Gauges - Types ; Selection and Installation, Strain gauge circuits; temperature compensation and calibration; Use of Strain Gauges on Rotating Shafts, Load Cells, Mechanical and Optical Strain Gauges.

UNIT - 2
Various Mechanical, Electro- Mechanical & Photoelectrical Sensors for sensing of Displacement, Velocity, Acceleration, Torque, Force, Temperature from Low to High Range, flow, level of fluid , pressure, angular speed, voltage, frequency and current.

UNIT - 3
Introduction to Multi-Channel Data-Acquisition System, Measurement Pods, Interface Hardware, Data Analysis Software, Interfacing.
Concepts and examples of automatic control systems, systems by differential equations, transfer function, block diagram, open and feed back control systems, signal flow graphs & its constructions. Control System components, error sensing devices and servo motors.

UNIT - 4
Control for mechanical systems & processes ; speed control system for steam/gas turbines. A constant tension ;reeling system, Electro-mechanical systems. Thermal systems, Pneumatic systems; Mathematical Models of physical systems, Feed back characteristics of Control Systems. TIPE response analysis; transient response analysis, tIPE response specifications, steady state-error.

UNIT - 5
Concepts of stability, Routh-Hurwiz stability criterion, relative stability. The root locus technique, use of construction rules without any derivation.
Frequency response analysis, Polar plots; stability in frequency domain, Bode / Logrithmic plots. Nyquist stability criterion.

Reference

1. MECHANICAL MESUREMENTS, T THOMAS G. BACKWITH, N LEWIS BUCK, ROY, NAROSA PUBLISHING HOUSE.
2. MECHANICAL MEASUEMENTS AND INSTRUMENTATIONS , A K SAWHNEY , DHANPAT RAI AND CO.
3. INDUSTRIAL INSTRUMENTATION AND CONTROL. S K SINGH, TATA McGRAW HILL

DYNAMICS OF MACHINES LAB.

Course/Paper 04IPE 201
IPE semester IV

1. To study inversion of four bar chain
2. Coupling Rod
3. Beam Engine
4. Steering Mechanism
(a) Study of quick return mechanism.(Crank and Slotted lever mech.)
(b) To draw velocity and acceleration diagram for Crank and slotted lever mechanism.
5. Study of inversion of Double slider chain
Oldhan Coupling
Scotch Yoke
Elleptical Trammel
6. To plot displacement v/s θ curve for various cams.
7. Study of various cam- follower arrangements.
8. To determine co-efficient of friction.
9. Study of various types of dynamometers, Brakes and Clutches.
10. To determine moment of inertia of the given object using of Trifler suspension.

FLUID MECHANICS LAB.

Course/Paper 04IPE 202
IPE semester IV

NAME OF EXPERIPENTS
1. Determine Metacentric height of a given body.
2. Determine Cd, Cv & Cc for given orifice.
3. Determine flow rate of water by V-notch.
4. Determine velocity of water by pitot tube.
5. Verify Bernoulli's theorem.
6. Determine flow rate of air by Venturi meter
7. Determine flow rate of air by orifice meter
8. Determine head loss of given length of pipe.
9. Determine flow rate of air by nozzle meter.
10. Study of Pelton, Kaplan Turbine models.

THERMAL ENGINEERING LAB. – II

Course/Paper 04IPE 203
IPE semester IV

1. Disassembling and assembling of multi-cylinder petrol and diesel engines and study of their parts.
2. To disassemble and assemble a 2-stroke petrol engine.
3. To disassemble and assemble a 4-stroke motor cycle engine and study of various engine parts.
4. Load test on a single cylinder 4-stroke diesel engine using a rope brake dynamometer and calculate volumetric and thermal efficiency and draw a heat balance-sheet.
5. Study of carburettors and MPFI system and disassembling and assembling of their parts.
6. To calculate valve timing of a multi-cylinder petrol engine and valve tappets adjustment.
7. Disassemble all the parts of a fuel injection pump and its parts study.
8. To disassemble the governor and study its various parts.

MECHANICAL MEASURMENTS & CONTROL LAB.
INSTRUMENTATION LAB. SESSIONAL

Course/Paper 04IPE 204
IPE semester IV

1. Displacement Measurement using Capacitive Pick - up System
2. Displacement Measurement Using Inductive Pick-up System
3. Displacement Measurement Using Light Dependent Register Set up
(i) Displacement v/s Registance at Constant Voltage
(ii) Voltage v/s Registance at Constant Displacement
4. Study of Speed Measurement System
(i) Magnetic Pick-up
(ii) Strobometer
5. Study of Load Measurement System
Load Cell + Load Indicator
6. Calibration of Thermocouple Wire.

MACHINE DESIGN LAB - I

Course/Paper 04IPE 205
IPE semester IV

1. Selection of material & IS coding
2. Selecting fit & assigning tolerances
3. Examples of Production considerations.

Problems on

1. Knuckle & Cotter joints
2. Torque : Keyed joints & shaft couplings
3. Design of screw fastening
4. Bending: Beams, Levers etc.
5. Combined stresses : Shafts, brackets, eccentric loading.
6. Design for rigidity (Transverse / Torsional)

V SEMESTER

ADVANCED MECHANICS OF SOLIDS

Course/Paper 05 IPE 101
IPE semester V

UNIT 1:-

Analysis of stress in 3-DIPEnsions: Body force, surface force and stress vectors, state of stress at a point, normal shear stress components, stress component on arbitrary plane, principal stresses in 3-DIPEntions, stress invariants, decomposition of stress matrix into hydrostatic and pure shear states, Lame's stress ellipsoid, differential equations of equilibrium.

UNIT 2:-

Analysis of strain in 3-DIPEnsions: introduction, deformation in neighborhood of a point, change of length of linear element, state of strain at a point, principal axes of strain and principal strains, compatibility conditions.

UNIT 3:-

Stress strain relations for linearity elastic bodies, generalized Hooke's law, stress-strain relations for anisotropic, orthotropic and isotropic materials.

UNIT 4:-

Bending of curved beams (Winkler-Bach formula); unsymmetrical bending of beams, shear centre.

UNIT 5:-

Stresses in thick cylinders, shrink fit stresses, stresses in rotating discs.

Reference

1. MECHANICS OF SOLIDS BY S H CRANDALL. N C DAHI McGRAW HILLS INTERNATIONAL EDITION
2. STRENGTH OF MATERIALS: G.H RYDER. ELBS PUBLICATIONS CO., LONDON
3. ELEMENTS OF STRENGTH OF MATERIALS. J.P TINNOSHNKO & G.H YOUNG, AFFILIATED EAST WEST PRESS, NEW DELHI
4. SOLID MECHANICS. G.M.A KAZMI. TATA MCGRAW HILL PUBLISHING CO. LTD.. NEW DELHI

5. STRENGTH OF MATERIALS: S. RAMAMRUTHAM. DHANPAT RAI AND PUBLICATIONS, NEW DELHI.

HEAT TRANSFER

Course/Paper 05 IPE 102
IPE semester V

UNIT 1:-
Introduction to heat transfer processes, conduction and radiation. Fourier's law of heat conduction, thermal conductivity, thermal conductivity of solids, liquids and gases, effect of temperature on thermal conductivity. Newton's law of cooling, definition of overall heat transfer coefficient. General parameters influence the value of heat transfer coefficient.
Conduction : General 3-DIPEnsoinal conduction equation in Cartesian , cylindrical and spherical coordinates; different kinds of boundary conditions; nature of differential equations; one dIPEnsional heat conduction with and without heat generation; electrical analogy; heat conduction through composite walls; critical thickness of insulation.

UNIT 2:-
Heat transfer from finned surfaces; fin efficiency and effectiveness, two dIPEnsional steady state heat conduction using analytical and numerical methods, periodic heat conduction.
Convection: review of Navier – Stokes and energy equation, hydrodynamic and thermal boundary layers; laminar boundary layer equations; forced convection appropriate non dIPEnsional members; effect of Prandtl number; empirical relations for flow over a flat plate and flow through pipes.

UNIT 3:-
Natural convection: DIPEnsional analysis, Granhoff number, boundary layers in external flows (flow over a flat plate only), boundary layer equations and their solutions, heat transfer correlations.

Heat transfer with change of phase: nature of vaporization phenomena; different regIPEs of boiling heat transfer; correlations for saturated liquid vaporization; condensation on flat plates; correlation of experIPEntal results, drop wise condensation.

UNIT4:-
Heat exchanger: Different types of heat exchangers, arithmetic and logarithmic mean temperature differences, heat transfer coefficient for parallel, counter and cross flow type heat exchanger; effectiveness of heat exchanger, N.T.U. method, fouling factor. Constructional and manufacturing aspects of Heat Exchangers.

UNIT 5:-
Thermal Radiation: Plank distribution law, Krichoff's law; radiation properties, diffuse radiations; Lambert's law. Radiation intensity, heat exchange between two black bodies heat exchanger between gray bodies. Shape factor; electrical analogy; reradiating surfaces heat transfer in presence of reradiating surfaces.

Reference

1. FUNDAMENTALS OF HEAT AND MASS TRANSFER, R C SACHDEVA, NEW AGE PUBLICATION

2. FUNDAMENTALS OF HEAT AND MASS TRANSFER, C P KOTHANDARAMAN, NEW AGE PUBLICATION
3. HEAT TRANSFER , J.P.HOLMAN
4. HEAT AND MASS TRANSFER, KERN, TMH
5. FUNDAMENTALS OF HEAT AND MASS TRANSFER, Dr. D.S. KUMAR

FUNDAMENTALS OF AERODYNAMICS

Course/Paper 05 IPE 103
IPE semester V

UNIT 1:-
Aerodynamic forces and moments over the body surface, concept of lift and drag, dIPEnsionless force and moment coefficient, centre of pressure of an aerofoil, nomenclature of aerofoil, angle of attack, circulation and lift over an-aerofoil, Kutta condition, Kelvin's circulation theorem.
UNIT 2:-
Blade theory; Symmetrical and non-symmetrical aerofoil. Energy transfer in terms of lift and drag, cascade nomenclature, turbine cascade nomenclature, cascade lift and drag coefficient.
UNIT3:-
Isentroic Flow: Velocity of sound; Mach angle; Mach number, steady isentropic flow through ducts; use of isentropic tables; condition for maximum discharge; choked flow; flow through convergent and convergent-divergent nozzle, supersaturated flow in nozzle.
UNIT 4:-
Adiabatic flow and flow with Heat Transfer: Adiabatic flow; Fanno line tables; entropy change; choking due to friction; flow through long ducts; Diabatic flow ; Rayleigh line; use of tables; change in entropy; effect of change in stagnation temperature.
UNIT 5:-
Normal Shock: Plane stationary normal shock; Ranking-Hugoniot relations; increase in entropy; Prandtl's relations; change in stagnation pressure across the shock.

Reference

1. FUNDAMENTALS OF AERODYNAMICS BY ASHISH DUTT SHARMA, S. CHAND & CO.
2. AERODYNAMICS BY R.K.RAJPUT DHANPAT RAI & PUBLICATION

INDUSTRIAL ENGINEERING

Course/Paper 05IPE 104
IPE semester V

UNIT l:-
Management Theory and Functions: Evolution of management, scientific management, Contribution to scientific management: Reactions and criticisms of Taylor, Fayol, Mayo, Levels of 'Management Administration and Management, functions of management. Decision-making.

UNIT 2:-

Business Forms and Organization:

Forms of Business:(i)Single proprietorship (ii) Partnership (iii) Joint stock company (iv) Private Ltd- Companies and public limited companies

Forming Joint Stock Companies (a) Registration (b) issue of Prospectus

(c) Commencement Certificate (iv) co-operative Society choice of Business forms

(v) State undertaking. Organization meaning. Types of organization; (i) Line organization (ii) Functional Organization (iii) Line Staff organization (iv) Line Staff Committee organization, span of control.

UNIT 3:-

Finance & Financial Statements: Introduction, Needs of Finance, Kinds of Capital Sources of fixed capital, Shares - (i) Ordinary Shares (ii) Preference Shares. Borrow capital. Surplus profits.

Sources of Working capital. Management of working capital. Financial Institutions. Profit & Loss Statement, Balance Sheet, Financial ratio: Liquidity ratio, Profits investment ratio, equity ratio, inventory ratio.

UNIT4:-

Interest and Depreciation: interest meaning, Compound interest. Annuities capital recovery Annuity present worth annuity sinking funds annuity compound Amount Annuity Nominal and effective rate of interest. Depreciation Meaning and causes. Need of Depreciation calculation, Methods of Depreciation. Straight line Methods. Sinking funds methods. Declining Balance Method, sum of years digits method (Syd Method).

UNIT 5:-

Labour relations and legislation: Profit sharing, fringe benefits etc.Trade Unions. Methods of setting disputes (i) Collective bargaining (ii) Conciliation (iii) Mediation (iv) Arbitration industrial disputes in India, Machinery for setting disputes. Trade Disputes Acts. The factory Act 1944, payment of wages act. Workman's compensation act.

Reference

1. PRODUCTION AND OPERATIONS MANAGEMENT, EWS BUFFA AND S KAPOOR
2. INDUSTRIAL ORGANISATION AND MANAGEMENT, BETHEL ATWATER, SMITH McGRAW HILL
3. INDUSTRIAL ENGG. BY M MAHAJAN, DHANTPAT RAI PUB.
4. PRINCIPLES OF INDUSTRIAL MANAGEMENT, ALFORD, RONALD PRESS

DYNAMICS OF MACHINES

Course/Paper 05 IPE 105
IPE semester V

UNIT l:-

Governors: Watt, Porter, Proell, Hartnell and spring controlled governors, governor effort, power, stability, inertia effects.

UNIT 2:-

Gyroscope: Principle of gyroscopic couple, effect of gyroscopic couple and centrifugal force on vehicle taking a turn, stabilization of sea vessels.

Inertia force analysis: Velocity and acceleration of slider crank and four bar mechanism, inertia force, piston thrust and forces on connecting rod, turning moment diagram, flywheel.

UNIT 3:-
Gears: Law of gearing, terminology, tooth form, standard interchangeable tooth profile, minimum number of teeth on pinion in contact with gear or rack, interference and undercutting, bevel, helical and spiral gears.

UNIT 4:-
Gear trains: Simple, compound, reverted and epicyclic gear trains, analytical, tabular, graphical and vector methods for velocity ratio, gear boxes- sliding and constant mesh for automobiles.

UNIT 5:- Balancing: Balancing of rotating masses, balancing of reciprocating masses, locomotives, IC engines, balancing machines.

Reference

1. THE THEORY OF MACHINES ,THOMAN BEVAN ,CS PUBLISHERS& DISTRIBUTERS DELHI
2. THEORY OF MECHANISM & MACHINES: JAGDISH LAL METROPOLITAN BOOK CO.LTD NEW DELHI
3. THEORY OF MACHINES : P.L. BALLANEY ,KHANNA PUBLISHERS DELHI
4. THEORY OF MECHANISM & MACHINES, A.KGOSH & A.K MALIK
5. ,AFFILATED WAST WEST PRESS PVT LTD NEW DELHI
6. THEORY OF MACHINES & MECHANISMS : J.E.SHINGHLEY & J.J UICKER,MC GRAW HILL INTERNATIONAL EDITION
7. KINETICS & DYNAMICS OF MACHINES: G. H MARTIN MC GRAW HILL

PRINCIPLES OF TURBOMACHINES

Course/Paper 05 IPE 106
IPE semester V

Unit 1:-
Basic concepts of turbomachines: Definition of Turbomachine, classification; Basic laws and governing equations; continuity equation, steady flow energy equation(1sl law of thermodynamics),2nci law of thermodynamics applied to turbomachines, Newton's 2nd law of motion applied to turbomachines - Euler's pump equation and Euler's turbine equation, dIPEnsional analysis applied to hydraulic machines, power coefficient, flow coefficient, head coefficient, non-dIPEnsional specific speed; Range of 'specific speeds for various turbomachines.
DIPEnsional analysis applied to compressible flow machines, pressure ratio as a Function of temperature ratio, mass flow rate parameter and speed parameter.

Unit 2:-
Centrifugal pumps: Main parts, work done and velocity triangles, slip and slip factor, pump losses and efficiencies, minimum starting speed, net positive suction head, performance curve.

Unit 3:-

Axial flow pumps; Description, velocity triangles, work done on the fluid, energy transfer, axial pump characteristics, cavitation.

Unit 4:-

Centrifugal compressors and fans: Components and description, velocity diagrams, slip factor, energy transfer, power input factor, stage pressure rise and loading coefficient, pressure coefficient, degree of reaction. Centrifugal compressor characteristic, surging, rotating Stall and Choking.

Unit5:-

Axial flow compressors and fans: Basic constructional features; turbine v/s compressor blades; Advantages of axial flow compressors, working principle, velocity triangle, elementary theory; stage work, work done factor, stage loading, degree of reaction; vortex theory; simple design calculations; introduction to blade design; cascade test; compressibility effects; operating characteristics.

Reference

1. GAS TURBINE THEORY: H COHAN G.F.C ROGER AND HIH SARAVANAMA LONGMAN SCIENTIFIC AND TECHNICAL PUB.
2. GAS TURBINE AND JET PROPULSION: M L MATHUR AND R P SHARMA, STANDARD PUBLISHER AND DISTRIBTOR
3. GAS TURBINE AND JET PROPULSION: V GANESHAN

PROD. ENGG. LAB. - I

Course/Paper 05 IPE 201
IPE semester V

Perform any twelve experIPEnts:

1. Study of single point cutting tool geometry & grind the tool as per given tool geometry.
2. Study the milling machine, milling cutters, indexing heads and indexing methods.
3. Prepare a gear on milling machine.
4. Prepare a hexagonal / octagonal nut using indexing head on milling m/c and to cut BSW/METRIC internal threads on lathe.
5. To cut multi-start square / metric threads.
6. To cut external metric threads & to meet it with the nut
7. To prepare the job by eccentric turning on lathe machine.
8. To prepare a job on shaper from given MS rod.
9. To study the various crystal structures and dislocations through models.
10. To study the Iron-Iron Carbide Equilibrium Diagram and sketch the various structures present at room temps.
11. Study of capstan lathe and its tooling and prepare a tool layout & job as per given drawing.
12. Study the principle & construction of the Metallurgical Microscope.
13. Prepare metallic samples for metallographic examination for study of Microstructure
14. Study the hardening of steel in different medium and at different cooling rates.
15. Study the effect of Carbon percentage on the hardness of Steel.

AUTOMOBILE ENGG. LAB

Course/Paper 05 IPE 202
IPE semester V

1. Valve refacing and valve seat grinding and checking for leakage of valves
2. Trouble shooting in cooling system of an automotive vehicle
3. Trouble shooting in the ignition system, setting of contact breaker points and spark plug gap
4. Demonstration of steering system and measurement of steering geometry angles and their impact on vehicle performance.
5. Trouble shooting in braking system with specific reference to master cylinder, brake shoes, overhauling of system and the adjusting of the system and its testing.
6. Fault diagnosis in transmission system including clutches, gear box assembly and differential.
7. Replacing of ring and studying the method of replacing piston after repair.

DYNAMICS OF MACHINES LAB. – II

Course/Paper 05 IPE 203
IPE semester V

1. To verify the relation T=Iùùp for gyroscope.
2. To plot force vs. radius and lift vs. speed curves for governors.
3. To plot pressure distribution curves on a journal bearing.
4. To perform wheel balancing.
5. To perform static and dynamic balancing on balancing set up.
6. To determine mass moment of inertia of a flywheel.
1- Study of a lathe gear box.
8. Study of a sliding mesh automobile gear box.
9. Study of a planetary gear box.

MATLAB AND COMPUTER GRAPHICS

Course/Paper 05 IPE 204
IPE semester V

(A) MATLAB: Use of MATLAB and its application to Mechanical Engineering problems.
(B) Turbo C Graphics: To make C programs to animate different mechanisms and system: Such as Slider Crank Mechanism, Quick Return Mechanism, Cam Follower, Solar system, ball motion in billiard, Rolling of wheel from inclined plane, Seesaw motion, Projectile moti
on of a wheel, etc.

VI Semester

DESIGN OF MACHINE ELEMENTS- II

Course/Paper 06 IPE 101
IPE semester VI

Unit 1

Fatigue Considerations in Design: Variable load, loading pattern, Endurance stresses, influence of size, surface finish, notch sensitivity & stress concentration. Goodman line, Soderberg, Design of machine members subjected to combined, steady and alternating stresses. Design for finite life. Design of Shafts under Variable Stresses.

Unit 2

Pre loading of bolts; effect of initial tension & applied loads, Bolts subjected to variable stresses. Design of members which are curved like crane hook, body of C-clamp, machine frame etc. Power screws like lead screw, screw jack.

Unit 3

Design of helical compression, tension, torsional springs. Springs under variable stresses. Design of belt, rope and pulley drive system, selection of chain & sprocket drive systems.

Unit 4

Design of gear teeth, Lewis and Buckingham equations; wear and dynamic load considerations, Design and force analysis of spur, helical, bevel and worm gears. Bearing reactions due to gear tooth forces.

Unit 5

Design of sliding & journal bearing; method of lubrication, hydrodynamic, hydrostatic, boundary etc. Minimum film thickness and thermal equilibrium.

Selection of anti-friction bearings for different loads and load cycles. Mounting of the bearings. Method of lubrication, selection of oil seals.

Reference

1. THE THEORY OF MACHINES ,THOMAN BEVAN ,CS PUBLISHERS& DISTRIBUTERS DELHI
2. THEORY OF MECHANISM & MACHINES: JAGDISH LAL METROPOLITAN BOOK CO.LTD NEW DELHI
3. THEORY OF MACHINES : P.L. BALLANEY ,KHANNA PUBLISHERS DELHI
4. THEORY OF MECHANISM & MACHINES, A.KGOSH & A.K MALIK
5. ,AFFILATED WAST WEST PRESS PVT LTD NEW DELHI
6. THEORY OF MACHINES & MECHANISMS : J.E.SHINGHLEY & J.J UICKER,MC GRAW HILL INTERNATIONAL EDITION
7. KINETICS & DYNAMICS OF MACHINES: G. H MARTIN MC GRAW HILL

MANUFACTURING SCIENCE AND TECHNOLOGY

Course/Paper 06 IPE 102
IPE semester VI

Unit 1

JIGS AND FIXTURES:- Introduction, definition and difference; usefulness of jigs and fixtures; design considerations; materials used; principles and methods of location; clamping elements; jig bushes; drilling jigs; fixtures for milling turning, boring and welding; assembly fixtures; indexing devices; economics of jigs and fixtures; complete design of a jig and a fixtures; complete design of a jig and a fixtures.

Unit 2

NEW MACHINING METHODS: Types of machining methods; hot machining; electric discharge machining (E.D.M.) ultrasonic machining (U.S.M.) ; Electron beam machining (E.B.M.) laser beam Machining (L.B.M.); abrasive jet machining (A.J.M.) ; plasma arc machining (PAM); economics of machining! ,

Unit 3

Precision Measurement : Standards of linear measurements; linear and angular measurements; screw thread measurement; measurement of effective diameter, pitch and thread angles; Gear

measurement, measurement of tooth profile, tooth thickness and pitch, Measurement of surface roughness. Quantitative methods of roughness measurements, Stylus and profilograph methods.
Precision Measuring Instruments: Comparators types; working principles applications and limitations of various comparators; optical flat; autocollimator indicators, slip gauges, bevel protector.

Unit 4
DESIGN OF SINGLE POINT CUTTING TOOLS: Introduction; functions of various tool angles; design of single point turning too]; parting tool; empirical determination of force components; optimum value of tool angles.
DESIGN OF Multipoint Cutting tool: Introduction; angle of contact; force analysis; approach through dIPEnsional analysis; force and power consumption; tooth forn1 and cutter design.

Unit 5
Design of Machine Tool Element
Design of Lathe bed, Material and construction feature, various bed section, designing for torsional rigidity, use of reinforcing stiffener in lathe bed.
Theoretical aspect of design of guide ways, Material and construction features, Antifriction guide ways.

Reference

1. PRODUCTION ENGINEERING SCIENCES BY P.C.PANDEY & C.K.SINGH, STANDARD PUBLISHERS & DISTRIBUTORS DELHI
2. PRODUCTION ENGINEERING BY P.C.SHARMA, S.CHAND & CO.PVT LTD. NEW DELHI
3. FUNDAMENTALS OF TOOL DESIGN: F.W.WILLSON; ASTME

NOISE, VIBRATION & HARSHNESS

Course/Paper 06 IPE 103
IPE semester VI

Unit 1
Sound level and subjective response to sound; Frequency dependent human response to sound, Sound pressure dependent human response. Decibel scale; Decibel addition, subtraction and averaging. Relationship among sound power, sound intensity and sound pressure level. Sound spectra. Octave band analysis. Loudness.
Noise: Effects, Ratings and Regulations; Non-auditory effects of noise on people, Auditory Effects of noise, Noise standards and limits in India.
Major sources of the noise; Industrial noise sources. Industrial noise control-strategies; Noise control at the source, Noise control along the path, Acoustic barriers, Noise control at the receiver.

Unit 2
Scope of vibration, important terminology and classification, Degrees of freedom, Harmonic motion; vectorial representation, complex number representation, addition. Derivation of equation of motion for one dIPEnsional longitudinal, transverse and torsional vibrations without damping using Newton's second law, D' Alembert's principle and Principle of conservation of energy. Compound pendulum and centre of percussion.
Damped vibrations of single degree of freedom systems. Viscous damping; underdamped, critically damped and overdamped systems, Logarithmic decrement. Vibration characteristics of Coulomb damped and Hysteretic damped systems.

Unit 3

Forced vibrations of single degree of freedom systems. Forced vibration with constant harmonic excitation. Steady state and transient parts. Frequency response curves and phase angle plot. Forced vibration due to excitation of support. Vibration Isolation and transmissibility; Force transmissibility, Motion transmissibility. Forced vibration with rotating and reciprocating unbalance. Materials used in vibration isolation.

Unit 4

System with two degrees of freedom; principle mode of vibration, Mode shapes. Undamped forced vibrations of two degrees of freedom system with harmonic excitation. Vibration Absorber; Undamped dynamic vibration absorber and centrifugal pendulum absorber.
Many degrees of freedom systems: exact analysis.

Unit 5

Many degrees of freedom systems: approximate methods; Rayleigh's, Dunkerley's, Stodola's and Holzer's methods.
Vibrations of continuous systems; Transverse vibration of a string, Longitudinal vibration of a bar, Torsional vibration of a shaft.

Reference

1. MECHANICAL VIBRATION, G K GROVER, NEMI CHAND AND BROS.
2. VIBRATION THEORY AND APPLICATIONS. W T THOMSON
3. VIBRATIONS & NOISE FOR ENGINEERING ; K.K.PUJARA, DHANPAT RAI & SONS,DELHI
4. MECHANICAL VIBRATIONS, DEN HARTOG
5. VIBRATION PROBLEMS IN ENGINEERING , TIMSHENKO

INTERNAL COMBUSTION ENGINES AND DIESEL POWER PLANT

Course/Paper 06 IPE 104
IPE semester VI

Unit 1

Introduction : Historical & Modern Development, Nomenclature, Classification & Comparison : SI & CI, 4 stroke – 2 stroke, First Law analysis, Energy Balance.
Testing & Performance : Performance parameters, Measurement of operating parameters e.g. speed, fuel & air consumption, Powers IHP, BHP, FHP, Efficiencies Thermal, Mechanical, Volumetric, Emission Measurement, Numerical problems, India & International standards of Testing, Emission.

Unit 2

Fuel & Combustion
Combustion in CI & SI engines : Ignition Limits, Stages of combustion, Combustion parameters. Delay period and Ignition Lag, Turbulence and Swirl, Effects of engine variables on combustion parameters, Abnormal combustion in CI & SI engines, Detonation & knocking, , Theories of detonation, Control of abnormal combustion, Combustion chamber Design principles, Types of combustion chamber.
Fuel:- Conventional : Petroleum, structure, Refusing Fuels for SI & CI engines, Knock rating, Additives, Fuels for Turbine & Jet Propulsion.
Alternative : Methanol, Ethanol, Comparison with gasoline, Manufacturing, Engine performance with pure Methanol, Ethanol & blends, Alcohols with diesel engine, Vegetable oils, Bio gas.

Unit 3

Engine Systems & Components
Fuel Systems :

SI Engine : Combustion & Injection, process & parameters properties of A/F mixture, Requirements of A/F per different operating conditions, Carburetion & Carburetors, types, Aircraft carburetor, comparison of carburetion & injection, F/A ratio calculations, Numerical problems. CI engine : Mixture requirements & constraints, Method of injection, Injection systems, CRDI etc. system components, pumps injectors. Ignition system : Conventional & Modern ignition systems Magneto v/s Battery, CB point v/s
Electronic ignition, Fuel Ignition Energy requirements. Spark galvanic, centrifugal, vacuum Firing order, spark plugs.

Unit 4

Engine Friction & Lubrication : Determination of friction, Lubrication principles, Types of lubrication, Places of lubrication Bearings and piston rings etc., Functions of Lubrication, Properties, Rating and Classification of lubricating oil, Additives, Lubrication systems. Engine Cooling : Requirements of cooling, Areas of heat flow, High temperature regions of combustion chamber. Heat Balance, Cooling Systems, Air, Water Cooling, Cooling system components. Supercharging : Objectives, Thermodynamic cycle & performance of super charged SI & CI engines Methods of super charging, Limitations Two stroke engines : Comparison of 4s & 2s engines construction & valve lining scavenging. Process parameters, systems, supercharging of 2 stroke engines.

Unit 5

Dual & Multi fuel engines : Principle, fuels, Combustion, performance Advantages, Modification in fuel system. Working principles of . Rotary, Stratified charge, Free piston, Variable compression ratio engines. Diesel Power plant: Requirements, capacity, operation, safety, Engine Generator Coupling,
Electrical load, Switching

Reference

1. I.C.ENGINES M.L.MATHUR,R.P.SHARMA, DHANPAT RAI PUBLIATIONS
2. I.C.ENGINE EDWARD F. ORBET , HARPER AND ROW
3. I.C.ENGINES, HEYWOOD

HYDRAULIC MACHINES AND HYDRO ELECTRIC POWER PLANT

Course/Paper 06 IPE 105
IPE semester VI

Unit 1

Review of fundamentals

Euler's turbine equation, principles of similarity applied to hydraulic machines, non-dIPEnsional specific speed. Classification of turbines on the basis of non-dIPEnsional specific speed. Unit and specific quantities.

Impact of Free Jets

Impulse momentum principle, force exerted by the jet on stationary flat and curved plate, hinged plate, moving plate and moving curve vanes.

Unit 2

Impulse Turbine

Classification of turbine, impulse turbines, Pelton wheel, Construction, working. Work done, head, efficiency and design aspects. Governing of impulse turbine.

Unit 3

Reaction Turbine

Radial flow reaction turbine, Francis turbine: construction and working. Work done, efficiency, design aspects.

Axial flow reaction turbine

Propeller and Kaplan turbine, bulb or tubular turbine- construction and working. Draft tube, governing of reaction turbine.
Performance characteristics and comparison of all the turbines.

Cavitation Phenomenon in hydraulic machines

Unit 4

Reciprocating Pumps

Classification, component and working, single acting and double acting, discharge, work done and power required, coefficient of discharge, indicator diagram, slip, effect of friction and acceleration theory of air vessels.

Fluid system

Hydraulic accumulator, Hydraulic intensifier, Hydraulic Press, hydraulic crane, hydraulic lift, hydraulic Ram, hydraulic coupling, hydraulic torque converter, air lift pump, jet pump.

Unit 5

Hydro Electric power station (HEPP) – Advantages and disadvantages of water power, selection of site for HEPP, hydrological cycle, hydrographs, essential elements of HEPP. Types of dams, conduits, spillways, surge tanks.
Classification of HEPP. Major, mini and micro power plants- present scenario in Rajasthan and India. Selection of turbine.

Reference

1. ENGINEERING FLUID MECHANICS, K.L.KUMAR, EURASIA PUBLISHING HOUSE P.Ltd.
2. FLUID MECHANICS AND FLUID POWER ENGG.: D S KUMAR, S K KATARIA AND SONS.
3. FLUID MECHANICS AND MACHINES: F M WHITE, JOHN WILLY AND SONS
4. FLUID MECHANICS : R.K.RAJPUT S. CHAND COMPANY LTD
5. FLUID MECHANICS VM STREETER McGRAW HILL

NUMERICAL METHODS AND APPLIED STATISTICS

Course/Paper 06 IPE 106
IPE semester VI

Unit 1

Errors and significant digits, Roots of algebraic equations Bisection method, secant method, Newton Raphson method, Graff's root- squaring method, Iterated synthetic division with quadratic factors method for finding complex roots,

Unit 2

Solutions of systems of equations (Gauss elimination, Gauss Jordan, and Partition method for linear system of equations, power method for partition, method for linear system of equations, power method for finding eigen values), Forward, backward , central and Divided differences, Newton's formula of interpolation for equal and unequal intervals. Lagrange's interpolation formula, Stirling's and Bessell's formula,

Unit 3

Numerical differentiation, Numerical Integration:- Trapezoidal, Simpson's rule and Gaussian integration (only formula applications) Differential equations and their solutions. Numerical methods for ordinary differential equations (Picard method, Taylor series method, Euler's method, Ranga Kutta Method, Predictor- corrector method, Adams- Bashforth method).

Unit 4

Sampling theory: Introduction: Moments, Moment generating functions, Skewness, Kurtosis, Correlation and Regression, Normal sampling distributions; Binomial distribution, Poisson distribution, Normal distribution; Sampling distribution of the means; sampling distribution of

the differences of the means; sampling distributions of proportions.

Unit 5
Tests of Significance; t-distributions, chi square distributions, F-distributions.
Regression And Correlation; Linear regression; correlation, multiple correlation & partial correlation Confidence Limits; Large samples, small samples, error bands in regression

Reference
1. MATHEMATICS STATISTICS BY J. N KAPUR & H.C SAXENA, S. CHAND & CO., NEW DELHI
2. MATHEMATICAL STATISTICS, M RAY & H.S. SHARMA, RAM PRASAD & SONS , AGRA
3. MATHEMATICAL STATISTICS, JOHN E. FREUND, PRENTICE HALL OF INDIA, NEW DELHI
4. ADVANCED MATHEMATICS FOR ENGINEERS, CHANDRIKA PRASAD, PRASAD MUDRANALAYA

MACHINE DESIGN – II SESSIONAL

Course/Paper 06 IPE 201
IPE semester VI

Problems on
1. Fatigue loading
2. Helical compression, tension and torsional springs design
3. Curved Beams
4. Preloaded bolts and bolts subjected to variable stresses
5. Belt, Rope and Chain drive system
6. Gear Design
7. Sliding contact bearing design
8. Anti-friction bearing selection

HEAT TRANSFER LAB

Course/Paper 06 IPE 202
IPE semester VI

EXPERIPENTS TO BE PERFORMED (MINIMUM TEN NUMBERS)
1. To Determine Thermal Conductivity of Insulating Powders.
2. To Determine Thermal Conductivity of a Good Conductor of Heat (Metal Rod).
3. To Measure the thermal Conductivity of Liquid.
4. To determine the transfer Rate & Temperature Distribution for a Pin Fin.
5. To Measure the Emmissivity of the Test plate Surface.
6. To Determine Stefan Boltzman Constant of Radiation Heat Transfer.
7. To Determine the Surface Heat Transfer Coefficient For Heated Vertical Cylinder in Natural Convection.
8. Determination of Heat Transfer Coefficient in Drop Wise & Film Wise condensation.
9. To Determine Critical Heat Flux in Saturated Pool Boiling.
10. To Study Performance of Simple Heat Pipes.
11. To Study and Compare LMTD and Effectiveness in Parallel and Counter Flow Heat Exchangers.
12. To Find the Heat transfer Coefficient in Forced Convection in a tube.
13. To determine the total thermal conductivity and thermal resistance of the given compound resistance in series.
14. To find out the thermal conductivity of given slab material.

15. To determine the individual thermal conductivity of different lagging in a lagged pipe.
16. To study the rates of heat transfer for different materials and geometries
17. To understand the importance and validity of engineering assumptions through the lumped heat capacity method.
18. Testing and performance of different heat insulators.

TURBOMACHINERY LAB

Course/Paper 06 IPE 203
IPE semester VI

1. Determination of Mechanical and volumetric efficiency of Reciprocating Air Compressor.
2. Testing of Reciprocating Air Compressor.
3. Determination of efficiency and Pressure distribution of Axial Flow Compressor.
4. Performance testing of Axial Flow Compressor.
5. Study and Performance of Simple Steam Turbine
6. Performance characteristics of Pelton wheel turbine.
7. Performance characteristics of Francis turbine.
8. Performance characteristics of Kaplan turbine.
9. Performance characteristics of variable speed centrifugal pump.
15
10. Performance characteristics of rated speed centrifugal pump.
11. Performance characteristics of multistage centrifugal pump.

COMPUTER ORIENTED NUMERICAL METHODS LAB

Course/Paper 06 IPE 204
IPE semester VI

1. To develop computer program to determine roots of a given equation using method of
a. False position
b. Newton -Raphson method,
2. To develop computer programs for solution of system of simultaneous linear equations using:
a. Gauss Elimination Technique, without and with specified boundary conditions, for full as well as bounded symmetric and unsymmetrical matrices
b. Gauss Shield iterative technique Successive over Relaxation(S.O.R) Technique
3. Linear and Non-Linear curve fitting technique
4. Numerical Integration with Simpson's rule and Gaussian Integration
5. Solution of ordinary differential equations by (i) Eular Method (ii) Runge-Kutta Method (iii) Taylor Series Methods
6. Solution of partial differential equations using S.O.R. Technique with special reference to heat conclusion equation.

SEMESTER VII

COMPUTER AIDED DESIGN

Course/Paper 07IPE 101
IPE semester VII

UNIT I.
Overview of Computer Graphics, Picture representation, Coordinate Systems, Output Graphcis Display devices. Raster Scan Graphics : DDA for line generation and Bresenham’s algorithm for line and circle generation.
UNIT II
Wire frame models, Parametric representation of curves, Plane curves : line, circle,

ellipse, parabola and hyperbola. Space curves : Cubic spline curve, Bezier Curve and B Spline
Curves. Blending of Curves.

UNIT III

Surface models and entities Parametric representation of Hermite Bicubic surfaces, Bezier surfaces and B-spline surfaces. Solid Models and entities, Solid Representation : B-rep. and CSG.
Comparison between three types of models**.**

UNIT IV

Two and three dIPEnsional transformation of Geometric models: Translation, Scaling Reflection, Rotation and Shearing. Homogeneous Representation, Combined Transformation. Projection of Geometric models: Parallel and Perspective Projection.

UNIT V

Clipping : Point clipping, Line clipping, Cohen- Sutherland algorithm etc. Viewing Transformation, Hidden Line and surface Removal : Techniques and Algorithms.

Reference
:

1. MATHEMATICAL ELEMENTS OF COMPUTER GRAPHICS, ROGERS AND ADAMS
2. CAD/CAM THEORY AND PRACTICE, ZEID IBRAHIM, TATA Mc GRAW HILL
3. COMPUTER GRAPHICS, PLASTOCK AND KALLAY

REFRIGERATION AND AIR CONDITIONING

Course/Paper 07IPE 102
IPE semester VII

Unit 1

Introduction

Refrigeration and second law of Thermodynamics, Refrigeration effect and unit of Refrigeration, Heat pump, reversed Carnot cycle.

Vapour Compression Refrigeration System

Analysis of simple vapour compression Refrigeration cycle by p-h and T-S diagram. Effect of operating conditions, liquid vapour heat exchangers, actual refrigeration cycle.

Multiple Evaporator and compressor system.

Application, air compressor system, Individual compressor, compound compression, cascade system. Application, air compressor systems, individual compressor, compound compression, cascade system.

Unit 2

Gas cycle Refrigeration

Limitation of Carnot cycle with gas, reversed Brayton cycle, Brayton cycle with regenerative H.E.

Air cycle for air craft

Necessity of cooling of air craft, Basic cycle, boot strap, regenerative type air craft refrigeration cycle.

Unit 3

Vapour Absorption System

Simple Vapour absorption system, Electrolux Refrigerator, Analysis of Ammonia absorption refrigeration system, Lithium Bromide Absorption Refrigeration System.

Refrigerants
Classification, Nomenclature, selection of Refrigerants, global warming potential of CFC Refrigerants.
Refrigeration Equipments
Compressor, condenser, evaporator, expansion devices – types & working.
Unit 4
Psychrometry
Psychometric properties, psychometric relations, psychometric charts, psychometric processes, cooling coils, By-pass factor and air washers.
Human Comfort
Mechanism of body heat losses, factors affecting human comfort, effective temperature, comfort chart.
Unit 5
Cooling load calculations
Internal heat gain, system heat gain, RSHF, ERSHF, GSHF, cooling load estimation, heating load estimation, psychometric calculation for cooling, selection of air conditioning, apparatus for cooling and dehumidification, Air conditioning system

Reference

1. REFRIGERATION AND AIR CONDITIONING: C P GUPTA
2. REFRIGERATION AND AIR CONDITIONING: BALLANEY
3. REFRIGERATION AND AIR CONDITIONING: C P ARORA
4. MODERN AIR CONDITIONING PRACTICE: NARMAN E HARRIS, TATA McGRAW HILLS

OPERATIONS RESEARCH

Course/Paper 07IPE 103
IPE semester VII

Unit 1
Linear Programming-
Introduction & Scope, Problem formulation, Simplex methods, primal & dual problem dual Simplex, sensitivity analysis
Unit 2
Transportation, Transshipment & Assignment problems
Dynamic Programming-
Multistage decision problems & solution, Principle of optimality.
Unit 3
Decision theory-
Decision under various conditions.
Game Theory-
Minimax & maximum strategies. Application of linear programming.
Integer Programming-
Cutting Plane method and Branch & Bound method
Unit4
Deterministic and Stochastic inventory models-
Single & multi period models with continuous & discrete demands, Service level & reorder policy
Unit 5
Simulations-
Simulation V/S mathematical modeling, Monte Carlo simulation, simulation language ARENA,

Example & cases.

Queing models-

Introduction Model types, M.M. 1 & M/M/S system cost consideration

Reference

1.INTRODUCTION TO OPERATIONRESEARCH, HILLER F.S & LIBERMAN G.J. CBS PUB.
2. OPERATION RESEARCH, TAHA H.A McMILLAN PUBLISHING COMPANY
3. FUNDAMENTALS OF OPERATION RESEARCH, SASIENI , WILLEY
4. OPERATION RESEARCH, HIRA GUPTA, DHANPAT RAI & CO.

STEAM TURBINES AND STEAM POWER PLANT

Course/Paper 07IPE 104
IPE semester VII

Unit 1

Steam Turbines:

Principle and working of steam turbines, type of turbines, impulse and reactions, compounding
for pressure and velocity. Velocity triangles for various types.

Unit 2

Stage efficiency, diagram efficiency, steam speed to blade, speed ratio for optimum performance.
Energy losses in steam turbine, turbine performance at various loads and governing of steam turbines. Constructional details and description of steam turbine components in brief.

Unit 3

Regenerative feed heating cycles:

Introduction : Most Ideal Regenerative feed heating cycle. Regenerative feed heating cycles and
their representation on T-s and h-s Diagram. Representation of actual process on T-s and h-s Diagram Regenerative cycles. Other types of feed heating arrangements. Optimum feed water
temperature and saving in Heat Rate. Feed Heaters, Direct Contact Heaters, Surface Heaters

Reheating – Regenerative and Regenerative water – Extraction Cycles.

Reheating of steam, Practical reheating and Non- reheating cycles, advantage & disadvantages of reheating, regenerative water extraction cycles, practical feed heating arrangements.

Unit 4

Governing and performance of Steam Turbines.
Description of back pressure Turbines, pass-out Turbines and Mixed Pressure Turbines.

Unit 5

Steam Power Plant

Steam power plants selection of location, working medium. Fuels and fuel handling equipments,
ash handling equipments. Air pre-heater, feed water treatment. Methods of combustion and various type of combustors. Types of boilers. Modern developments in steam boilers. Description
of cooling tower.

Reference

1. STEAM AND GAS TURBINE, R YADAV CENTRAL PUB. HOUSE. ALLAHBAD

2. THERMODYNAMICS AND HEAT POWER ENGINEERING. VOL 1, M.L.MATHUR AND F.S.MEHTA, JAIN BROS, NEW DELHI
3. GAS DYNAMICS, S.M YAHA

PRODUCT DEVELOPMENT AND LAUNCHING

Course/Paper 07IPE 105
IPE semester VII

Unit 1

Importance of new product-Definition-importance-Development Process.

Importance of new product for growth of enterprise. Definition of product and new product. Responsibility for new product development. Demands on product development team. Classification of products from new product development. Point of view- Need based/Market pull
products, Tech. push, Platform based, Process based and customized products. New product development process and organization. Generic product development process for Market Pull Products. Modification of this process for other types of products.

Unit 2

Need analysis- Problem Formulation

Establishing economic existence of need, Need Identification and Analysis, Engineering Statement of Problem, Establishing Target Specification.

Unit 3

Generation of Alternatives and Concept Selection

Concept generation- a creative process, Creativity, Road Elects to creative thinking- Fear of criticism and Psychological set. Tools of creativity like brain storming, Analogy, Inversion etc.,
Creative thinking Process.
Concept feasibility and Concept Selection, Establishing Engineering Specification of Products.

Unit 4

Preliminary & detailed design- Design Review

Preliminary design- Identification of subsystems, Subsystem specifications, Compatibility. Detailed design of subsystems, component design, Preparation of assembly drawings. Review of product design from point of view of Manufacturing, Ergonomics and aesthetics.

Unit 5

Management of New Product – development and Launch.

New Product Management's Challenges – Maintaining focus, Promotion of Right Culture, Management of Creativity, Top Management attention.
Design Team Staffing and Organization. Setting key mile stone, Identification of Risk Areas, Project Execution and Evaluation Product Launch Strategies.
Project Planning – Project Task matrix, estimation of tIPE & resources, project scheduling.

Reference

1. PRODUCT DESIGN AND MANUFACTURING: CHITAL, A K AND GUPTA R C. PHI
2. PRODUCT DESIGN AND MANUFACTURING: ULRICH KTAND EPPINGER SD MCGRAW HILL
3. PRODUCT DESIGN AND MANUFACTURING: LINDBECK JR, PRENTICE HALL
4. ENGG DESIGN, G E DEITER

MECHATRONICS

Course/Paper 07IPE 106
IPE semester VII

Unit 1
Introduction about Mechatronics, scope of Mechatronics, application, process control automation
and N/c Machines.

Unit 2
Sensors and Transducers
Introduction, classification, specification, characteristics of transducers, type of transducers displacement, strain, vibration pressure, flow, temperature, force & torque, tactile.

Unit 3
Hydraulic Pneumatic & Electrical actuators
Pumps & Compressors, control valves & accessories, actuators, fluid power symbols, fluid power
systems, switching devices, solenoids, motors.

Unit 4
Data Acquisition and Control System
Introduction, Quantitizing theory, Analog to Digital Conversion, Digital to Analog (D/A) conversation, transfer function, transient response & frequency response & frequency response,
stability criteria.

Unit 5
Design of Mechatronic systems
Introduction, Automatic front and book and cutting in steel rolling mill, lift control system, CNC
lathe, temperature control of a heat treatment furnace, EOT crane control panel, Grey grain separators, electrode arm control in electric arc furnace.

Reference

1. A TEXTBOOK OF MECHRATOICS : R.K.RAJPUT S.CHAND & CO
2. MECHRATONICS : ASHISH DUTT SHARMA

METAL CASTING

Course/Paper: 07IPE-107
IPE semester VII

Structure of silica and different types of clays , bonding mechanism of silica water-clay systems. Swelling of clays, sintering adhesion and colloidal clay; silica grain shape and size Distribution standard permeability A.F.S. clay Characteristics, Ingredients and additives of moulding sand, core sands
Solidifications of Metals , nucleation, free energy concept, critical radius of nucleus. Nucleation and growth in metals and alloys . Constitutional super cooling . Columnar Equiacquiesced and

dendritic structures. Freezing of alloys centerline feeding resistance . Rate Of solidification, tIPE of solidification, mould constant . Fluidity of metals, volumes redistribution . Analysis of the process.

Riser design shape, size and placement. Effect of appendages on riser ring. Effective feeding distances for simple and complex shapes. Use of chills, gating design, filling tIPE. Aspiration of gases. Top, bottom and inside gating. Directional solidifications stresses in castings. Metal mould reactions. Expansion scale and metal penetration. Analysis of the process

Various moulding and casting processes, hot box, cold box process, investment, shell moulding, full mould processdie-casting, ceramic shell mould, vacuum moulding etc. (6 Hours) Non-ferrous Die-casting of Aluminum and its alloys, brass and bronze.

References

1. Fundamentals of Metals Casting by Flimm; Addison Wesley.
2. Principles of Metal Casting by Heine Loper and Resenthal; McGraw Hill.
3. Product Design & Process Engineering by Hielel and Draper; Mcgraw Hill.
4. Foundry Practice by Salman & Simans; Issac Pitman.
5. Metals Handbook- Metal Casting;ASME.

Note: Eight questions out of entire syllabus and well-distributed are to be set; students are required to attempt 5 questions.

METAL CUTTING

Course/Paper: 07IPE-108

IPE semester VII

Introduction, system of Tool nomenclature, Tool Geometry, Mechanism of Chip, formation and Forces in orthogonal cutting, Merchant's force diagram.

Oblique Cutting: Normal chip reduction coefficient under oblique cutting, true shear angle, Effective rake, influx region consideration for deformation, direction of maximum elongation, effect of cutting variables on chip reduction coefficient, forces system in oblique cutting, effect of wear land on force system, force system in milling, effect of helix angle.

Fundamentals of Dynamometry, Theoretical determination of forces, angle relations, heat and temperature during metal cutting; distribution, measurement, analysis, theoretical estimation of work piece temperature, hot machining

Fundamental factors, which effect tool forces: Correlation of standard mechanized test. (Abuladze relation), nature of contact and stagnant phenomenon, rates of strains, shear strain and normal strain distributions, cutting variables on cutting forces.

Cutting Tools: Tools materials analysis of plastic failure (from stability criterion), Analysis failure by brittle fracture , wear of cutting tools , criterion, flank and crater wear analysis, optimum tool life, tool life equations, (Taylor's woxen etc) Tool life test, machining optimization, predominant types of wear; abrasive, adhesive, diffusion wear models, wear measurements and techniques, theory of tool wear oxidative mathematical modeling for wear, test of mach inability and influence of metallurgy on mach inability. Economics of metal machining Abrasive Machining: Mechanics of grinding, cutting action of grit, maximum grit chip thickness, Energy and grit force temperature during grinding,wheelwear,grinding,processsimulation,testingOfgrindingwheels,mechanicsoflappingand honing,freebodyabrasion.

References

1) Principles of Machine tools by Sen & Bhattacharya by New Central BookAgency.
2) Machining of Metals, by Brown; Prentice hall.
3) Principles of Metal cutting by Shaw; Oxford I.B.H.
4) Metal cutting theory & Cutting tool design by Arshimov & Alekree, MIR Publications.
5) Machining Science & Application by Knowenberg Longman Press.

Note: Eight questions out of entire syllabus and well-distributed are to be set; students are required to attempt 5 questions.

P.E. LAB.-II

Course/Paper: 07IPE-201

IPE semester VII

Minimum any ten experIPEnts can be performed

1. By using lathe tool dynamometer measure the cutting forces in all directions and calculate the following:
a) Shear plane angle
b) Coefficient of friction
c) Power consumption
2. By using the drill dynamometer measure the torque, and thrust in Drilling operation.
3. By using the tool work thermocouple, measure the tool chip interface temp
4. To determine chip reduction coefficient in turning.
5. To study the different mechanisms of tool wear and their measurements.
6. To determine Taylor Tool life exponents by Facing test
7. To study the effect of cutting variables on surface finish in any cutting (Turning, Drilling, Milling, Shaping, grinding etc) operation
8. Study of the effect of clearance and shear angle on the blanking and piercing operations
9. To determine the effect of percentage of reduction and the semicone angle of the die on the drawing load.
10. To find the effect of percentage of reduction and the die geometry on extruding force.
11. ExperIPEntal determination of coefficient of friction for metal forming.
12. Study of the drop forging operation (flow ability, forging load etc by plasticine model.
13. To determine roll load in the sheet rolling process.
14. Students will be given at least one practical problem regarding design and fabrication of Jig, Fixture or Press tool.
15. To measure a gap with help of slip gauges
16. Measurement of angle/taper using a sine bar.
17. Study and use of a bore gauge.
18. Flatness testing of a surface pate and machine tool bed by using a sensitive spirit leve
19. Measurement of screw thread elements by tool Makers microscope and Inspection of various elements of screw thread by optical projector.
20. To measure flatness and surface defects in the given test piece with the help of monochromatic check light and optical flat.
21. Measurement of chordal thickness of Gear tooth by Gear tooth vernier caliper.
22. Use of three-wire method to determine the effective diameter of external threads.
23. To study the capstan lathe, tool holders and attachments and to prepare the given job as per given drawing.
24. Cutting forces measurement during milling using milling dynamometer.
25. Measurement of flatness and roundness of a given machine/ground/lapped flat and round surface respectively using dial gauge.

MECHANICAL VIBRATIONS LAB

Course/Paper: 07IPE-202

IPE semester VII

1. To verify relation T = 2ð / (l/g) for a simple pendulum.
2. To determine radius of gyration of compound pendulum.
3. To determine the radius of gyration of given bar by using bifilar suspension.
4. To determine natural frequency of a spring mass system.
5. Equivalent spring mass system.
6. To determine natural frequency of free torsional vibrations of single rotor system.
(a) Horizontal rotor (b) Vertical rotor
7. To verify the Dunkerley's rule.
8. Study of free damped torsional vibration to performing the experIPEnt to find out damping co-efficient.
9. To conduct experIPEnt of trifler suspension.
10. Harmonic excitation of cantilever beam using electro-dynamic shaker and determination of resonant frequencies.
11. Study of Vibration measuring instruments.

I. C. Engine Lab.

Course/Paper: 07IPE-203

IPE semester VII

Perform any 10 experIPEnts

1. Study of IC Engine models
2. Study of working of four stroke petrol engine and four stroke diesel engine with the help of cut
section models.
3. Study of working of two stroke petrol and two stroke diesel engine with the help of cut section
models.
4. Study of fuel supply system of a petrol engine (fuel pump and simple carburetor)
5. Study of complete carburetor (Solex carburetor)
6. Study of Petrol Injection System.
7. Study of fuel supply system of a Diesel engine (fuel pump and fuel injector)
8. Study of Ignition systems of an IC Engine (Battery and Magneto ignition system) and Electronic ignition system.
9. Study of Lubrication system of an IC Engine (mist, splash and pressure lubrication)
10. Study of cooling systems of an IC Engine (air cooling and water cooling)
11. To conduct a performance test on diesel engine to draw heat balance sheet for given load and
speed
12. To determine friction power of diesel engine by Willan's line or fuel rate extrapolation method.
13. To conduct a performance test on the variable compression ratio engine and to draw the heat
Balance sheet for given compression ratio, speed and load and plot the performance curves.
14. To conduct a performance test on a four cylinder four stroke petrol engine and to draw the

heat balance sheet and performance curves.
15. To calculate the indicated power, friction power and mechanical efficiency of four stroke four cylinder petrol engine at full load and rated speed by Morse test.
16. To draw the valve timing diagram of a Four stroke S.I. or C.I. Engine using experIPEntal setup.
17. Analysis of engine exhaust gases using Orsat apparatus / gas analyzer.

PRACTICAL TRAINING & INDUSTRIAL VISIT

Course/Paper 07IPE 204
IPE semester VII

Industrial visit (20 marks) is for the duration of 10 days at the end of V semester and Practical Training (80 marks) is for the duration of 30 days at the end of VI semester. Both will be evaluated during the VII semester and graded accordingly

SEMESTER VIII

RENEWABLE ENERGY TECHNOLOGY

Course/Paper 08IPE 101
IPE semester VIII

Unit 1
Global and National scenarios, Form and characteristics of renewable energy sources
Solar Energy
Solar radiation, its measurements and prediction. Solar thermal collectors, flat plate collectors,
concentrating collectors. Basic theory of flat plate collectors, solar heating of buildings, solar still, solar water heaters, solar driers; conversion of heat energy in to mechanical energy, solar
thermal power generation systems.
Solar Photovoltaic
Principle of photovoltaic conversion of solar energy, types of solar cells and fabrication. photovoltaic applications: battery charger, domestic lighting, street lighting, water pumping, power generation schemes
Unit 2
Wind Energy
Atmospheric circulations, classification, factors influencing wind, wind shear, turbulence, wind speed monitoring, Betz limit, WECS: classification, characteristics, applications.
Unit 3
Ocean Energy
Ocean energy resources, ocean energy routes. Principles of ocean thermal energy conversion systems, ocean thermal power plants. Principles of ocean wave energy conversion and tidal energy conversion.
Unit 4
Other Sources:
Nuclear fission and fusion; Geothermal energy: Origin, types of geothermal
energy sites, site selection, geothermal power plants; Magneto-hydro-dynamic (MHD) energy

conversion. Formation of biomass, photosynthesis; Biomass resources and their classification;
Chemical constituents and physicochemical characteristics of biomass; Biomass conversion processes;

Unit 5

Fuel Cells

Thermodynamics and electrochemical principles; Basic design, types, applications.

Hydrogen Energy

Economics of hydrogen; Production methods.

Reference

1. RENEWABLE ENERGY SOURCES: G N TIWARI, SAYESTA SUNEJA NAROSA PUBLISHING HOUSE
2. SOLAR ENGINEERING, H.P.GUPTA
3. SOLAR THERMAL ENGINEERING BY DUFFIE AND BACKURAN

OPERATIONS MANAGEMENT

Course/Paper 08IPE 102
IPE semester VIII

Unit 1

Introduction: Scope of Operations Management, operations manager and the management process. Operations Strategy, Competitiveness and Productivity.
Demand Forecasting: components of forecasting demand, Approaches to forecasting: Qualitative
methods, TIPE series methods, Regression methods, Accuracy and control of forecasts, Selection
of forecasting technique.

Unit 2

Products and Services, Process, Types of Production Systems: Mass, Batch, Job shop production.
Product and process matrix. Process planning and Process analysis. Capacity Planning: Defining
and measuring capacity, steps in capacity planning process, determining capacity requirements,
Capacity alternatives, Evaluation of alternatives- Cost- Volume analysis etc.

Unit 3

Production Planning: Production planning objective and functions, Bill of material, Capacity and
man power requirement planning, Planning levels: long range, Intermediate range and Short range planning, aggregate planning; Objective, Strategies, graphical and mathematical techniques
of aggregate planning, master production scheduling, MRP and MRPII Systems

Unit 4

Production Control: Capacity control and priority control, production control functions; Routing,
scheduling, dispatching, expediting and follow up. Techniques of production control in job shop
production, batch production and mass production systems,

Unit 5

Material Management: Objectives, scope and functions of material management, planning,

procurement, storing, ending and inventory control. Purpose of inventory, inventory cost, inventory control systems, Selective inventory control systems, Determination of EOQ, Lead tIPE and reorder point. Methods of physical stock control

Reference

1. PRODUCTION AND OPERATION MANAGEMENT, ADAM EVERETT E. & EBERT RONALD J. PHI
2. PRODUCTION AND MANAGEMENT: S N CHARRY. TMH
3. OPERATIONAL MANGEMENT: THEORY AND PROBLEMS ON MONK J. G McGRAW HILL
4. PRODUCTION SYSTEMS, RIGGS, J.L WILEY EASTERN

GAS TURBINES AND GAS POWER PLANT

Course/Paper 08IPE 103
IPE semester VIII

Unit1

Review of basic principles and fundamentals of rotating machines.
Cycle arrangements, open cycle arrangements, closed cycle arrangements, basic requirement of
the working medium, properties of various working media, applications of gas turbine, comparison of gas turbines with reciprocating engines.
Ideal cycles: simple gas turbine cycle, heat exchange cycle, reheat cycle, reheat and heat exchange cycle, intercooled cycle, intercooled cycle with heat exchanger, intercooled and reheat
cycle, intercooled cycle with heat exchange and reheat. Comparison of various cycles.

Unit 2

Practical cycles and their analysis, effect of variable specific heat, mechanical losses, loss due to
incomplete combustion, polytropic efficiency, performance of actual cycles, comparison of ideal
vs actual cycles.
Jet propulsion cycles.

Unit 3

Thermodynamic cycles, advantages, disadvantages and performance characteristics of Ramjet
engine, pulsejet engine, turboprop engine, turbojet engine, turbofan engine.
Calculation of specific thrust and efficiency.

Unit 4

Combustion systems, combustion theory applied to gas turbine combustor, factors affecting combustion chamber design and performance. Combustion chamber geometry, fuel injection and
ignition, use of cheap fuels.
Impulse and reaction type gas turbines. Velocity triangles and calculation of work done,efficiency etc..

Unit 5

Advantages of a gas turbine power plant, comparison with steam, diesel and hydel power plant. Performance of GT power plant-part load efficiency, airflow rate, thermal efficiency, gas turbine blading and fuels. Gas turbine materials. Free piston engine plant.

Reference

1. STEAM AND GAS TURBINES, R YADAV, CENTRAL PUB. HOUSE ALLAHBAD

2. THERMODYNAMICS AND HEAT POWER ENGINEERING M L MATHUR AND F S MEHTA JAIN BROS. NEW DELHI
3. GAS DYNAMICS, S M YAHA

NON CONVENTIONAL MACHINING PROCESSES

Course/Paper 08IPE 104
IPE semester VIII

New Technology, Introduction, Mechanical Processes, Abrasive jet Technology, Ultrasonic machining, whirling jet machining. Fundamental principles, process parameters, characteristics,

Tool design, Metal removal rate-analysis, important part design ,Analysis of the Process .Chemical and Electro-chemical machining Introduction. Principles & scheme, Process parameters, metal removal rate, dynamic and hydro-dynamic & hydro optimization, electrolytes. EDM: Introduction-basic principles & scheme, circuitry controls, metal removal rate, machining accuracy, optimization, selection of tool material and tool design, Di-electric, Analysis. Laser Beam Machining & Electron beam machining background, production of Laser, machining by Laser and other applications, Electron beam action, DIPEnsionless analysis to establish correlation, behavior EBM parameters. High Velocity forming of metals, explosive forming principles and applications, Electro-hydraulic and other applications, Analysis of the process.

References

1) Non-traditional machining methods; ASME.
2) New Technology by Bhattayacharya; I.E. (India)
3) Ultrasonic cutting by Rozenberg; Consultants Bureau; N.Y.
4) Electro - spark machining of metals; Vol. 2 by Lazarenko; consultant Bureau; N.Y.
5) Electro chemical machining by DE Baar; McDonald.

Note:

Eight questions out of entire syllabus and well-distributed are to be set; students are required to attempt 5 questions

JIG,FIXTURE & DIE DESIGN

Course/Paper 08IPE 105
IPE semester VIII

Jigs and Fixtures: Elements of jigs and fixtures, costs calculations. Locating element, clamping elements, procedure in designing. Jig and fixtures: Fits and tolerances analysis.
Non-Standard clamping devices, centralizers, equalizers, actuators (Pneumatic, hydraulic electric and electronic.)
Automatic loading and unloading devices.
Types of Frunions : Single, double and multi-axis and indexers.
Transfer line jigs & fixtures for the operation of Multi-drilling, boring, milling and grinding.
Assembly line fixtures.
Universal Jigs and Fixtures.
Transfer-devices, transfer machine, modulation-design concept, in process gauging.
Design of Dies: Elements of Dies and Punch. Types and design procedure, progressive dies, drawing
die, bending die etc. Analysis

References

1. Jigs and Fixtures Design by Franklin-D-Jones.
2. Jigs and Fixtures by Colovin; F.H. and Massachusettes Institute of Technology.

3. Jigs and Fixtures Design by Hardy; H.W.
4. Jigs and Fixtures Design by Haughton; P.S.
5. Jigs and Fixtures by Parson.

Note:
Eight questions out of entire syllabus and well-distributed are to be set; students are required to attempt 5 questions.

COMPUTER AIDED DESIGN & MANUFACTURING

Course/Paper 08IPE 106
IPE semester VIII

Introduction: CAD/CAM contents and tools; history of CAD/CAM development; CAD/CAM Market trends; Definition of CAD/CAM tools,

Industrial look at CAD/CAM.

CAD/CAM Hardware: Introduction; types of systems; CAD/Cam systems evaluation criteria; Input devices; output devices, hardware integration and networking; hardware trends.

CAD/CAM Software: Introduction; graphics standards; basic definition and modes of graphic operations; user interface; software modules, modeling and viewing; software documentation; Software development; efficient use of CAD/CAM Software; Software trends.

Microprocessor based CAD/CAM: Introduction; several features, system implementation; Hardware components and configuration; micro-based CAD software; file translation; operating systems, mechanical applications; micro-CAD trends; product distribution trends

Mathematical Representation of Curves: Introduction; wire frame models; wire frame, Entities, curves representation, parametric representation of analytical and synthetic curves, curve manipulation; design and Engineering applications.

Mathematical Representation of Surfaces: Introduction, surface models, surface entities, surface representation, parametric representation of analytic and synthetic surfaces, surface manipulation.

Mathematical Representation of Solids: Introduction, solid models, solid entities, solid representation, fundamentals of solid modeling, half spaces; boundary representation; constructive solid geometry sweep representation, solid modeling based applications; design and engineering applications.

Geometric Transformations: Introduction; transformation of geometric models, mappings of geometric models; inverse transmission and mappings; projections of geometric models; design and Engineering applications.

Mechanical Assembly and Tolerancing: Introduction; assembly modeling, representative schemes, generation of assembling sequences; tolerance concepts.

Part Programming and Manufacturing: NC, CNC and DMC machines, part programming, manufacturing processes, process planning, tool path generation; design and engineering applications

References

- CAD/Cam by Mikell P. Groover Mecry Wo Elimmers, Jr. 1991.
- The CAD/Cam Hand Book by Bed ford Masa Chusetles.
- Automation, Production Systems, and Computer Aided Manufacturing, Prentice Hall by Groover M.P.
- Numerical Control and Computer Aided Manufacturing by Pressman, R.N. and William, J.E. John Wiley & Sons NewYork.
- CAD/CAM Theory and practice by Ibrahim Zeid; Tata McGraw Hill, New Delhi (1998)

Note: Eight questions out of entire syllabus and well-distributed are to be set; students are required to attempt 5 questions.

RELIABILITY AND MAINTENANCE ENGINEERING

Course/Paper 08IPE 107 (I)
IPE semester VIII

Unit 1
Introduction: Maintenance Objectives and Functions; Maintenance Organisation and Administration of Maintenance Systems. Need of planned maintenance. Maintenance policies; Breakdown, tIPE based maintenance: Block replacement, age replacement and periodic replacement policy. Corrective and preventive maintenance. Maintenance planning, Scheduled maintenance. Cost of maintenance versus Cost of equipment and production delays. Inspection: Inspection intervals, Inspection reports, card history system.

Unit 2
Predictive maintenance. Equipment wear records, standards. Equipment used in predictive maintenance. Computerized maintenance, Total Productive Maintenance. Methods of condition
monitoring, Non-destructive testing, Liquid Penetrate, Magnetic particles, Ultrasonic testing, and
Vibration analysis. Oil analysis, Radiographic testing.

Unit 3
Reliability: Definition, failure data analysis, Mean failure rate, mean tIPE to failure (MTTF), mean tIPE between failures (MTBF) , hazard rate, Bathtub curve. Use of Weibull probability chart foe assessing characteristics life, guarantee period etc.

Unit 4
System reliability: Series, parallel and mixed configuration; Simple problems. Reliability improvement: Techniques, use of Pareto analysis-Design for reliability, redundancy unit and stand by redundancy, Optimization of reliability.

Unit 5
Spare Parts Management: Spare parts, features and categorization of spares, cost considerations, Techniques of cost reduction; Selective controls used in spare parts control; ABC analysis, FSN, XYZ, VED and other approaches. Inventory control of spares.

COMPUTATIONAL FLUID FLOW AND HEAT TRANSFER

Course/Paper 08IPE 107 (II)
IPE semester VIII

Unit1
Review of basic fluid mechanics and the governing (Navier-Stokes) equations.
Types of partial differential equations- hyperbolic, parabolic and elliptic.
Traditional solution methods- method of characteristics, separation of variables, Greens function method.

Unit2
Preliminary computational techniques: Discretisation, converting derivatives to discrete algebric expressions, spatial derivatives, tIPE derivatives. Approximation of derivatives,

Taylor series expansion, general techniques. Accuracy of discretisation process-higher order vs lower order formulae.

Unit3
Finite difference method: conceptual implementation, application to transient heat conduction problem. Convergence, consistency and stability of FD equation.

Unit4
Weighted residual methods: General formulation, Introduction to Finite Volume method. Finite Volume method: Equations with first derivatives and second derivatives. FV method applied to Laplace's equation.

Unit5
Finite Element method: Linear interpolation, quadratic interpolation, two dIPEnsional interpolation. Application to heat transfer problems.

Reference

1. ENGINEERING FLUUID MECHANICS: K L KUMAR, EURESIA PUBLISHING HOUSE
2. FLUID MECHANICS AND MACHINES: F M WHITE, JOHN WILLY AND SONS
3. FLUID MECHANICS : R.K.RAJPUT S. CHAND COMPANY LTD
4. FLUID MECHANICS VM STREETER McGRAW HILL
5. ENGINEERING FLUID MECHANICS BY D S KUMAR

FINITE ELEMENT

Course/Paper 08IPE 107(III)
IPE semester VIII

Introduction to FEM and its applicability, Review of mathematics : Matrix algebra, Gauss elimination method, Uniqueness of solution, Banded symmetric matrix and bandwidth. Structure
analysis : Two-force member element, Local stiffness matrix, coordinate transformation, Assembly, Global stiffness matrix, imposition of Boundary conditions. Properties of stiffness matrix.

UNIT II : One-DIPEnsional Finite Element Analysis
Basics of structural mechanics : stress and strain tensor, constitutive relation. Principle of minimum Potential. General steps of FEM, Finite element model concept / Discretization, Derivation of finite elements, equations using potential energy approach for linear and quadratic 1-D bar element, shape functions and their properties, Assembly, Boundary conditions, Computation of stress and strain.

UNIT III: Two dIPEnsional Finite Element Analysis :
Finite element formulation using three nodded triangular (CST) element and four nodded rectangular element, Plane stress and Plain strain problems. Shape functions, node numbering and connectivity, Assembly, Boundary conditions. Isoparametric formulation of 1-D bar elements, Numerical integration using gauss quadrature formula, computation of stress and strain.

UNIT IV : Finite Element Formulation from Governiing Differential Equation :
Method of Weighted Residuals : Collocation, Subdomain method, Least Square method and Galerkin's method. Application to one dIPEnsional problems, one-dIPEnsional heat transfer, etc. Introduction to variational formulation (Ritz Method.)

UNIT V :
Higher order elements, Lagrange's interpolation formula for one and two independent variable. Convergence of solution, compatibility, element continuity, static condensation, p and h methods of mesh refinement, Aspect ratio and element shape.
Application of FEM, Advantages of FEM. Introduction to concept of element mass matrix in dynamic analysis.

Reference

1. INTRODUCTION TO FINITE ELEMENT IN ENGINEERING, TIRUPATI R.CHANDRAPATLA & ASHOK D. BELEGUNDU, PRENTICE HALL OF INDIA Ltd.
2. CONCEPTS AND APPLICATIONS OF FINITE ANALYSIS, ROBERT D. COOK, DAVID S. MALKUS MICHAIEL E. PALESHA
3. FINITE ELEMENT PROCEDURES : KLAUS JURGAN BATHEPRENTICE HALL OF INDIA

CAD LAB.

Course/Paper: 08IPE-201
IPE semester VIII

EXPERIPENTS TO BE PERFORMED (MINIMUM FIVE EXPERIPENTS)
1. Introduction & different features of the CAD Software
2. 2-D Drafting
3. 3-D Modeling
4. 3-D Advanced Modeling
5. Assembly modeling
6. Feature Modification and Manipulation
7. Detailing
8. Sheet Metal Operations
9. Surface Modeling
10. One DIPEnsional problems of Finite Element Method.

(These exercises may be performed by any of the following Advanced CAD Software such as Pro E /Epigraphic/ AutoCAD Inventor)

CAM AND ROBOTICS LAB.

Course/Paper: 08IPE-202
IPE semester VIII

EXPERIPENTS TO BE PERFORMED
CAM (Minimum Five ExperIPEnts)
1. To prepare part programming for plain turning operation.
2. To prepare part programming for turning operation in absolute mode.
3. To prepare part program in inch mode for plain turning operation.
4. To prepare part program for taper turning operation.

5. To prepare part program for turning operations using turning cycle.
6. To prepare part program for threading operation.
7. To prepare part program for slot milling operation.
8. To prepare part program for gear cutting operation.
9. To prepare part program for gear cutting using mill cycle.
10. To prepare part program for drilling operation.
11. To prepare part program for multiple drilling operation in Z-axis.
12. To prepare part program for multiple drilling in X-axis.
13. To prepare part program for multiple drilling in X and Z axis using drilling cycle.

Robotics (Minimum Five experIPEnts)

1. To detect the sensor scanning system to overcome limitation of fixed sensors on various Robotic applications, ultrasonic sensor, laser range finders, infrared detectors and miniature.
2. To find the horizontal and vertical movement up to 180o in either direction.
3. To detect objects with infrared ray detector.
4. To determine object distance (3cm – 300cm).
5. To detect distance (10cm to 80 cm) with infrared object detector.
6. To determine 5 Axis Robotic Arm movement and its degree of rotation.
7. To lift the object and place 100m away in various directions.
8. To find the gripper movement (0 to 50mm).
9. To study various Robotic Arm Configurations.
10. To study Pick and Place Robot

INDUSTRIAL ENGINEERING LAB.

Course/Paper: 08IPE-203

IPE semester VII

1. Determination of tIPE standard for a given job using stopwatch tIPE- study.
2. Preparation of flow process chart, operation process chart and man-machine charts for an Existing setup and development of an improved process.
3. Study of existing layout of a workstation with respect to controls and displays and suggesting improved design from ergonomic viewpoint.
4. to carryout a work sampling study.
5. To conduct process capability study for a machine in the workshop.
6. To design a sampling scheme based on OC curve.
7. To conduct Stewart's experIPEnts on known population
8. Generation of random numbers for system simulation such as facility planning, job shop Scheduling etc.

SEMESTER IX

METAL FORMING

Course/Paper 09IPE 101
IPE semester IX

Plasticity True stress and true strain, true stress-strain curves, selection of stress-strain curves for Cold and hot working, yield of isotropic plastic material, yield criteria. Tresca maximum sheer-strain energy criterion, plastic incompressibility, Poisson's ratio for plastic deformation flow rule, strain hardening function, heat generation and heat transfer in metal forming processes, temperatures in Quasi-continuous forming operations. Examination of Metal forming processes.

Prediction of working loads and maximum deformation analysis of the processes of wire Drawing /tube drawing, strip drawing and extrusion. Various parameters/variables affecting the Processes of wire drawing, tube drawing, strip drawing and extrusion; various methods of tube drawing and their comparison. Working loads for plain strain forging of strip and disc under

conditions of well lubrications and sticking of material with die and under mixed conditions, Prediction of working loads under above approach (simple plain strain and axis symmetric problems)

Lubrication in metal forming processes, principles and mechanism of lubrications, hydrodynamic and their film lubrication, boundary and extreme pressure lubricants, solid lubricants, lubricants used for rolling and cold drawing, forging, extrusion and deep drawing processes; defects in various metal forming processes like rolling, forging, extrusion, wire drawing and deep drawing and their causes and remedial measures.

Theory and deep drawing of circular blanks, analysis of the process, prediction of radial stress and punch load, ironing, wrinkling, blank holding and various parameters/variables affecting the deep drawing process.

Rolling: Classification of rolling mills, analysis of the process. Prediction of roll pressure for flat strip rolling in the leading and lagging zones, roll separating forces, torque on the roll, affect of front and back tensions, affect of support rolls, various factors which affect rolling force

References

1. An Introduction to the Principles of Metal working by Rowe, Arnold.
2. Metal forming analysis by Avitzer, Mcgrawhill.
3. Plasticity for mechanical Engineering by Johnson & Merlore; Van Northand.
4. High Velocity working Metals by ASME; EEE

Note: Eight questions out of entire syllabus and well-distributed are to be set; students are required to attempt 5 questions.

MACHINE TOOL DESIGN

Course/Paper 09IPE 102

IPE semester IX Introduction, Classification of machine tools , elements of machine tools, selectionofspeedandfeed,Gearboxdesignvarioustypesofclutchsystems, Sohopke and Report drives, double bond gears analysis, Lohr criterion for optimizing double bond gear.

Step less drives, mechanical step less drive analysis, hydraulic step less drive & circuit analysis, design features, throttle valves, tracer controlled hydraulic circuit, hydraulic servo controls, electrical step less drive circuits and charterstics Strength and rigidity consideration, process capability and compliance,

Design of lathe bed, use of stiffness in bed, design of radial drill column and milling machine column. Analysis of spindle bearings, slides and guides, design of spindle/arbor, antifriction and journal bearings, hydrodynamic action in slides, analysis of hydrostatic bearings, roller guides, re circulating ball analysis, stick slip motion in guides-models, force analysis of lathe guide ways.

Vibrations of machine tools and dynamic rigidity: Effects of vibrations, source of vibrations, self excited vibration, single degree of freedom chatter, velocity principle and related models, regenerative principles, chatter in lathe, drilling milling and grinding. Tlusty and palace model, Peters model, elimination of machine tool structures matrix, finite elements and lumped constant models.

Automation: Automation drives for machine tools, degree of automation, semi-automatics, analysis of collect action, design, of collet, bar feeding mechanism, tooling layout, single spindle, multi spindle automatic, transfer machine, indexing Geneva mechanism, analysis, Swiss type automatic machine loading and unloading. Transfer-devices, modular design concept in process gauging.

Control system of machine tools: Control: Mechanical, electrical, hydraulic, numerical, fluidic, basic principle of cam control, hydraulic controls, fluid controls, numerical controls, feed back systems, primary systems programming. Basic devices, adaptive control. (6 Hours)

References

1. Machine tool design by Mehta; Tata Mc Graw Hill.
2. Principles of machine Tools by Sen & Bhattacharya; New Central Book Agency.
3. Machine Tool design by Basu & Pal; Oxford & IBH
4. Machine tool Design Vol. I to IV by Acherkan; Mir Publishers.
5. Design principles of Metal cutting machine tools: Koerigsberger; Pergaman Press.

Note: Eight questions out of entire syllabus and well-distributed are to be set; students are required to attempt 5 questions.

CUTTING TOOL DESIGN

Course/Paper 09IPE 103

IPE semester IX Fundamentals of Cutting tools design, cutting tools and their principal elements, Tool geometry, system of nomenclatures and their interrelations, setting for the grinding of various basic cutting tool (turning, drilling, milling)

Tool materials, developments of various tool materials, their relative characteristics, modern trend in tool development, concept of tool life. Single point tools; purpose and principle types and their characteristics, design procedure of single point tools, design of various high production tools,

design of carbide tools. Form tools; purpose and types, design procedure and sharpening. Drills; purpose and principal types and their construction and geometry, development in the shape of twist drills analysis.

Milling Cutters; Purpose and types and their construction procedure of profile sharpened and form relieved cutters,

Design of hobs, analysis. Broaches: Purpose and types, design features of various broaches. Introduction of numerically controlled tools and their applications

References

- Principles of machine tools By Sen & Bhattacharya; New Central book Agency.
- Metal cutting theory and cutting tool design by Arshinov &Alekreev; Mir Publishers.
- Principles of Metal cutting By Shah; Oxford. IBH

Note: Eight questions out of entire syllabus and well-distributed are to be set; students are required to attempt 5 questions.

PRODUCT DESIGN & DEVELOPMENT

Course/Paper 09IPE 104
IPE semester IX

Importance of product design in industry. Principal requirements of good product design. Factors and considerations affecting product design. Ergonomic factor in product design. Product design methodology and techniques. Basic elements and concepts of visual design. Materials, forms, function and color relationships. Product graphics, product development and testing. Packaging materials their characteristics and applications. Packaging design considerations

Value engineering, concept, advantage and applications. Value, types of values. Analysis of function,

using and evaluating functions. Value engineering techniques. Value control.

REFERENCES

1. Industrial Design Mayall Mc Gruw Hill
2. Product Design & Niebel & Mc Graw Hill
3. Process Engineering Draper
4. Introduction to Design Asimov Prentice Hall
5. Value Engineering Mudge Mc Graw Hill

Note: Eight questions out of entire syllabus and well-distributed are to be set; students are required to attempt 5 questions.

. MANAGEMENT OF PRODUCTION SYSTEM

Course/Paper: 09MPE-105
MPE Semester-IX

Systems Theory and concepts: Systems defined, function and elements of a system, general system theory, systems theory and organization ,systems concept and management. The systems approach, planning and systems concepts. Control and systems concepts, Information and systems concepts

Quantative techniques of system analysis: Systems analysis, problem solving, scientific method, mathematical analysis, models, computer techniques of analysis. Linear programming input output analysis, queuing Monte-Carlo techniques, Simulation, Industrial dynamics **Behavioral Aspects of System Design:** The motivation factors in System design, leadership factors in system design. The need for systematic human relationships, the need for systems change, resistance to change, behavioral consequences of system changes, Microanalysis of complex, man machine open systems, concept as a basis of human integration, meeting the human and social problems.

Flow system: Increasing complexity in distribution and production, increasing cost of a distribution, the total flow system, planning the transformation, service system, integrating systems. Program Management: Impact of advancing Technology, large scale integrating system. Program Management, concept functional stages of program-management, organizational modifications, matrix organization, applications of program Management.

Management Cybernetics: Management cybernetics in controlling a manufacturing firm, production and inventory control systems, production,

inventory, and employment control systems, the enterprise control systems.

References

- Elements of production planning and control by Eilon; Macmillan.
- Automatic Production system and computer integrated manufacturing by Groover; Prentice Hall.
- Manufacturing systems Engineering by Hitachi; Taylor & Francis. Hitogni.
- Manufacturing systems and Analysis by Baudin; Yourdon.
- Management of systems by Nauhria, R.N. & Parkash, Rajnish.
- Modern Production Management by Elwood, S. Buffa Wiley, Eastern(1984)
- Production/ Operations Management by Rishards I. Koin TMH (1979)

Note: Eight questions out of entire syllabus and well distribution are to be set; students are required to attempt 5 questions.

METHODS ENGINEERING & ERGONOMICS

Course/Paper 09IPE 106 (I)
IPE semester IX

Introduction to Industrial Engineering and productivity measurement of productivity, Introduction to Work study, methods-study principles and motion economy, filming techniques and micro-motion analysis, Introduction to work measurement. TIPE study, performance allowances, work sampling, predetermined motion system, standard data system, job evaluation of merit rating. Wage incentive plans, MTM (Methods TIPE Measurement)

Introduction of Ergonomics, man/ machine/environment systems concept. Development of ergonomics. (3 Hours)

Design Approach: Anew design, modification, of existing design, assessment of design. Limitation of man and machine with respect to each other, posture-standing at work, seated at work, work station heights and seat geometry. Human anthropometry and its use in work place layout, Analysis.

Controls: Hand controls and foot controls, location of controls and work place envelope. Recommendation about hand and foot push buttons, rotary selector switches, hand wheels, crank levers etc. Instruments and displays. (7 Hours)

Work Load: Static and dynamic muscular work. Human motor activity, metabolism, physical work load, measurement of physical work load, mental work load, measurement of mental work load, repetitive and inspection work, work duration and rest pauses, principles of motion economy, Analysis.

Climates:

a.) Heat Humidity: Body heat balance, effective temperature scales, zones of discomfort, effect of heat on body and work performance.

b.) Vibration: Terminology, Response of body to low frequency (LF) vibration, vibrations and discomfort, effect on health of worker, high frequency

vibration, effect of H.F. vibrations, methods of reducing vibrations, analysis.

c.) Noise: Terminology, physiological effects of noise, annoyance of noise, speed interference, hearing loss, temporary and permanent thresh hold

shift, effect of noise on performance, reduction of noise, personal noise protection. Analysis.

References

1. Methods Engineering Study Krick, EV.
2. Work study and Ergonomics Shah,H.S.DhanpatRai&Sons-1992.
3. Introduction of Ergonomics Bridger-TataMcGrawHill-1995.
4. Work Study Khanna, OP- Dhanpat Rai & Sons-1995.
5. Sound, Noise and Vibration Control-Lyle, F.Yerges-VanNostrand-1978.

Note: Eight questions out of entire syllabus and well-distributed are to be set; students are required to attempt 5 questions.

ENTERPRENEURSHIP

Course/Paper 09IPE 106 (II)
IPE semester IX

Introduction: Factors leading to Industrial development Entrepreneur definition and various concepts, self awareness. Motivational aspects, attitude development, creativity, copying with un certainties, resilience.

Information: Industrial potential, environmental scanning, Identification of opportunities, dynamics of an opportunity, business opportunities recognition. Government policy for Industrial development. Choice of Technology Research for patents, product development.

Planning: Planning of an Industrial unit, project planning, identification of market and demand for product, role of significant variables, execution of projects legal aspects, financial aspects and labour laws, feasibility studies, sectoral, Industrial and unit level feasibility, exposure to past, present and future. Entrepreneurial Management: Business finance Management through elementary concept break even, working capital knowledge of various institutions and their mode of assistance. Elements of Production processes, quality control, Inspection methods. Production planning group dynamics.

References

1. Entrepreneurship development programme in India and its relevance to developing countries by VG Patel; EDI- India; Ahmedabad (1987)
2. Developing of New Entrepreneurship by EDI India; Ahmedabad (1987)
3. Self made Impact making Entrepreneurship by G.R. Jain and M.A.Ansari; by EDI India; Ahmedabad (1988)

Note:
Eight questions out of entire syllabus and well-distributed are to be set; students are required to attempt 5 questions.

STATISTICS AND RELIABILITY ENGINEERING

Course/Paper 09IPE 106 (III)
IPE semester IX

Statistics: Introduction; Principal uses of Statistics, Sampling, Frequency Distributions; Normal Distribution; Logarithmic normal distribution; Poisson distribution; correlations; Probability, Tests of significance; the Chi-Square tests; Differences in means of large samples; Differences in means of small samples; the t-test; Confidence limits; Analysis of Variances; TIPE Series, Monte-Carlo Method.

Reliability: Introduction, Reliability concepts and patterns of failure; Reliability Management; Reliability for system effectiveness.)

Reliability and Hazard Rates: Failure data; Reliability function; Failure rate and hazard rate; Common distributions in failure mechanisms-Exponential, Weibull, Gamma, Lognormal Extreme Value; Model selection for component failures; Failure analysis

Reliability Prediction and Analysis: Reliability prediction based on Exponential Distribution; System Reliability analysis- Block diagram method, fault tree and sconces tree methods, event tree method, failure mode, failure mechanisms.

Reliability Design: Design for Reliability, Design process, assessment methodology, Reliability allocation, Reliability improvements, Selection of

Components to improve system Reliability

References

1. Reliability Engg. & Terotechnology, by A. K.Gupta, Machmillan India Ltd. Delhi (1996)
2. Introduction to Reliability Engg. By E.E, Levis,Wiley& Sons NewYork
3. Reliability Engg. by L.S. ShriNath Affiliated East West Press
4. Probability and Statistics for Engineers by R.A. Johnson, Prentice Hall of India Pvt. Ltd, New Delhi (1995)

Note: Eight questions out of entire syllabus and well-distributed are to be set. Students are required to attempt five question

PROJECT WORK

Course/Paper 09IPE 201
IPE semester IX

OBJECTIVE

The objective of the project work is to enable the students in convenient groups of not more than 3 members on a project involving theoretical and experIPEntal studies related to the branch of study. Every project work shall have a guide who is the member of the faculty of the institution. The student should select any one of the topics offered from the department or select one on his own duly approved from the department. Candidate is required to submit the detailed synopsis of the work that he would complete in the part-II

Each student shall finally produce a comprehensive report covering back ground information, literature survey, problem statement, project work details and conclusion. This final report shall be typewritten form as specified in the guidelines.

SEMINAR

Course/Paper 09IPE 202
IPE semester IX

OBJECTIVE

The students are to select one technical topic related its branch for Seminar. The student is to submit the synopsis for assessment and approval. Progress for preparation of the seminar topic would be continuously assessed from tIPE to tIPE. Two periods per week are to be allotted and students are expected to present the seminar Progress. A faculty guide is to be allotted and he / she will guide and monitor the progress of the student and maintain the attendance.

Students have to give a final presentation for 15 minutes on his topic. Students are encouraged to use various teaching aids such as over head projectors, power point presentation and demonstrative models. This will enable them to gain confidence in facing the placement interviews

SEMESTER X

DISSERTATION

Course/Paper 10IPE 201
IPE semester X

The student will submit a synopsis at the beginning of the semester for the approval from the University project committee in a specified format. Synopsis must be submitted within a Two weeks. The first defense, for the dissertation work, should be held with in a one month. Dissertation Report must be submitted in a specified format to the University for Evaluation purpose.