VII Semester B.E. (Mechanical)

Subject code	Subject	University Exam / College Assesment	Marks				Paper durations-Hrs	Lecture-Hrs	Tutorials-Hrs	Pract/Drg-Hrs
			Theory		Practical					
			Maximum	Passing	Maximum	Passing				
7ME1	PRODUCTION TECHNOLOGY II	Univ	80	40	-	-	3	3	1	-
		College	20		-					
7ME2	ELECTIVE I	Univ	80	40	-	-	3	3	1	-
		College	20		-					
7ME3	ELECTIVE II	Univ	80	40	25	25	3	3	1	2
		College	20		25					
7ME4	ENERGY CONVERSION II	Univ	80	40	25	25	3	3	1	2
		College	20		25					
7ME5	MACHINE DESIGN III	Univ	80	40	25	25	3	3	1	2
		College	20		25					
7ME6	PROJECT SEMINAR	College	-	-	50	25	-	-	-	3
Total			500		200			15	5	9

12/5/18

VIII Semester B.E. (Mechanical)

Subject code	Subject	University Exam / College Assesment	Marks				Paper durations-Hrs	Lecture-Hrs	Tutorials-Hrs	Pract/Drg-Hrs
			Theory		Practical					
			Maximum	Passing	Maximum	Passing				
8ME1	INDUSTRIAL MANAGEMENT	Univ	80	40	-	-	3	3	1	-
		College	20		-					
8ME2	ELECTIVE III	Univ	80	40	-	-	3	3	1	-
		College	20		-					
8ME3	AUTOMATION IN PRODUCTION	Univ	80	40	25	25	3	3	1	2
		College	20		25					
8ME4	ENERGY CONVERSION III	Univ	80	40	25	25	3	3	1	2
		College	20		25					
8ME5	COMPUTER AIDED DESIGN	Univ	80	40	25	25	3	3	1	2
		College	20		25					
8ME6	PROJECT	Univ		-	75	75	-	-	-	6
		College		-	75					
Total			500		300			15	5	12

*Subject pertaining to Applied Science & Humanaties BOS** Subject pertaining to Metallurgy BOS
Subject pertaining to Electronics BOS

(Dr. M. Balaraman)

7ME1 **PRODUCTION TECHNOLOGY- II**

UNIT I

Work Study : Productivity –Concept and objectives of productivity. Types of productivity. factors affecting productivity. Tools and techniques to improve productivity. Measurement of productivity. Work study and methods study : Definitions, objectives, steps in method study, process charts, string diagram. motion study, micro motion study, SIMO Chart

[9 Hrs.]

UNIT II

Work measurement : Objectives, definition, stop watch study, work sampling , PMTs MTM & Work factor method

Ergonomics : Objectives, Human factors in Engg., Man machine system, Display design, design controls. Principles of motion economy, work place design.

[9 Hrs.]

UNIT III

Plant layout : Objectives, Principle, Types of plant layout, Material handling. Objectives Principles and selection of material handling equipments, Unit load concept, material flow pattern.

[6 Hrs]

UNIT IV

Forecasting : Need for forecasting, classification of forecasting methods, like judgmental technique, time series analysis, least square method, moving average method, exponential smoothing method.

[7 Hrs.]

UNIT V

Production planning and control :Definition, objectives of PPC. functions of PPC, types of production

Value analysis and value Engineering: Introduction, steps involved in value analysis. Applications in Manufacturing

[7 Hrs.]

UNIT VI

Maintenance: Objectives, Types of maintenance, preventive, predictive, break down maintenance Reliability and maintainability analysis Failure data analysis, reliability, MTBT, MTTR, Batch tub curve, series parallel and stand by system

[7 Hrs.]

RECOMMENDED BOOKS

1. Work study by ILO
2. Motion and Time study by Barnes
3. Ergonomics – Murell
4. PPC - Jain & Agrawal
5. Industrial Engg. and Project management by Mart and Telsang
6. Reliability Engg. By Balguruswami
7. Plant layout and Material Handling by James Apple.

7ME2 ELECTIVE – I INDUSTRIAL ROBOTICS

UNIT I

Automation and Robotics. Robot anatomy. configuration of robots. joint notation schemes. work volume. introduction to manipulator kinematics. position representation. forward and reverse transformations of a 2- DoF arm. a 3-DoF arm in two dimension. a 4-DoF arm in three dimension. homogeneous transformations in robot kinematics. D-H notations. solving kinematics equations . introduction to robot arm dynamics.

[7 Hrs.]

UNIT II

Basic control system models. slew motion. joint-interpolated motion and straight line motion. controllers like on/off. proportional. integral. proportional plus integral. proportional plus derivative. proportional plus integral plus derivative

[7Hrs.]

UNIT III

Robot actuation and feedback components. position and velocity sensors. actuators and power transmission devices. mechanical grippers. vacuum cups. magnetic grippers. adhesive grippers. pneumatic. electric. hydraulic and mechanical methods of power and control signals to end effectors

[8 Hrs.]

UNIT IV

General considerations in robot material handling. material transfer applications. pick and place operations. palletizing and related operations. machine loading and unloading. die casting. plastic molding. forging. machining operations. stamping press operations using robots.

[8 Hrs.]

UNIT V

Use of robot in spot welding. continuous arc welding. spray coatings. Robots in Assembly Operations

[7 Hrs.]

UNIT VI

Robot cell layouts. multiple robots and machine interface. other considerations in work cell design. work cell control. interlocks. error detection and recovery. workcell controller. robot cycle time analysis.

[8Hrs.]

TEXT BOOKS

1. M.P. Groover, M. Weiss, R.N. Nagel, N. G. Odrey " INDUSTRIAL ROBOTICS", McGRA -HILL INTERNATIONAL.
2. Koren " Robotjcs"

7ME2 **ELECTIVE – I TOOL DESIGN**

UNIT I

Theory of metal Cutting

Introduction. Mechanics of chip formation . Cutting tool materials. Single point cutting tool. Designation of cutting tools. ASA system. Importance of Tool angles. Orthogonal rake system. Classification of cutting tools. Types of chips. determination of shear angle. velocity relationship . force relations. Merchant's Theory. Cutting power. Energy consideration in metal cutting. Tool wear. Tool life. Tool life criteria. variable affecting tool life. Machineability

[8 Hours]

UNIT II

Design of single Point Cutting Tool

Form tools- Introduction. Types. design of form tools

Drills- Introduction. Types. Geometry. Design of drill

Milling cutters - Introduction. Types. Geometry. Design of milling cutters.

Reamers. Taps & Broaches - constructional features only [7 Hours]

UNIT III

PRESS TOOL DESIGN

Introduction. Press operations - Blanking. piercing . Notching . Perforating . Trimming . Shaving . Slitting . Lancing. Nibbling . Bending. Drawing

Press working equipment - Classification. Rating of a press. Press tool equipments. arrangement of guide posts . Press selection. press working terminology . Working of a cutting die . Types of dies - Simple dies. inverted die. compound dies. combination dies. progressive dies. Transfer dies. Multiple dies Principle of metal cutting . strip layout. clearance. angular clearance. clearance after considering elastic recovery. cutting forces. method of reducing cutting forces. Die block. Die block thickness. Die opening. Fastening of die block. back up plate. Punch. Methods of holding punches. Strippers. Stoppers. Stock stop. Stock guide. Knock outs. Pilots. Blanking & Piercing die design - Single & progressive dies

[9 Hours]

UNIT IV

Bending Forming & Drawing dies

Bending methods - Bending Terminology, V- Bending, Air bending, bottoming dies, Wiping dies, spring back & its prevention, channel dies.

Design Principles - Bend radius, Bend allowance, Spanking, width of die opening, Bending pressure.

Forming Dies- Introduction, Types - solid form dies, pad type form dies, curling dies, Embossing dies, coining dies , Bulging dies, Assembly dies.

Drawing Dies - Introduction, Differance between blending, forming & drawing, Metal flow during drawing, Design, Design consideration - Radius of draw die, Punch radius, Draw clearance, Drawing speed, Calculating blank size, Number of draws, Drawing pressure, Blank holding pressure.

[6 Hours]

UNIT V

Forging Die Design & mould Design

Forging Die Design : Introduction, Classification of forging dies, Single impression dies, Multiple Impression dies. Forging disign factors - Draft, fillet & corner radias, parting line, shrinkage & die wear, mismatch,finish allowances, webs & ribs Preliminary forging operation - fullering, edging, bending, drawing, flattering, blacking finishing, cutoff. Die design for machine forging - determination of stock size in closed & open die forging. Tools for flash trimming & hole piercing, materials & manufacture of forging dies .

Mould Design: of Simple Blow Moulds for Articles such as bottles, cans
Design of simple two plate injection moulds . Mould Materials

[8 Hours]

UNIT VI

Design of jigs & fixture :- Introduction, locating & clamping - principle of location, principle of pin location, locating devices, radial or angular location, V - location, bush location, design principle for location purpose, principle for clamping purposes, clamping devices, design principles common to jigs & fixtures.

Drilling Jigs :- Design principles, drill bushes, design principles for drill bushings.
Types of drilling jigs - Template jig, plate type jig, open type jig, swinging leaf jig, Box type jig, channel type jig . Jig feet.

Milling Fixtures :- Essential features of a milling fixtures, milling machine vice.
Design principles for milling fixtures, Indexing jig & fixtures, Automatic clamping devices.

[7 Hours]

TEXT BOOKS

1. Fundamentals of Tool Design :ASTME
2. Tool Design :Donaldson
3. Tool Design :Pollock
4. Jigs & Fixtures Design and construction : Pollock
5. Jigs & Fixtures Design Manual : Hernrickson
6. Jigs & Fixtures : H. B. Goroshkin
7. Production Engineering : P. C Sharma
8. Production Technology : R. K. Jain
9. Fundamentals of Tool Engineering : Basu, Mukharjee & Mishra

7ME2 ELECTIVE – I SYNTHESIS OF MECHANISMS

UNIT I

Introduction to kinematics, types of mechanism, kinematics synthesis, science of relative motion, tasks of kinematic synthesis with practical applications, Degree of freedom, class-I, class-II chain, Harding's notation, Grashof criterion, Grubler's criterion

[7 Hrs]

UNIT-II

Introduction to position generation problem ,concept of pole, two &three position generation synthesis, pole triangle, Relationship between moving & fixed pivots. Four position generation, opposite pole quadrilateral, center point &circle point curve, Burmester's point.

Matrix method for position generation problem, rotation matrix, displacement matrix.

[8 Hrs.]

UNIT-III

Introduction to function generation problem, co-ordination of input-output link motion, relative pole technique, inversion technique, overlay technique, graphical synthesis of quick return mechanisms for optimum transmission angle.

Types of errors, accuracy points, cheby sher's spacing, frudenstein's equation

[7 Hrs]

UNIT-IV

Introduction to path generation problem, synthesis for path generation with and without prescribed timing using graphical method. Coupler curves, cognate linkages, Robert's law of cognate linkages.

Complex number method for path generation problem 3 precision points

[8 Hrs]

UNIT-V

Synthesis for infinitesimally separated position, concept of polode and centrod, Euler's savery equation, inflection circle, Bobbilier and Hartman's construction.

[7 Hrs]

UNIT-VI

Optimal synthesis of planer mechanisms, powell's search method, least square method, penalty function.

Introduction to spatial mechanisms, D-H notations, introduction to kinematic analysis of robot arm.

[8 Hrs]

Text Books:

1) Applied linkage synthesis – TaO D C.
2) Advanced mechanism design – G.N. Sandor. A.G. Erdman
3) Kinematics and mechanisms design – C H. Suh C.W. Radchiffe

7ME2 **ELECTIVE – I RENEWABLE ENERGY SYSTEMS**

UNIT I

Solar Energy: Introduction, solar constant, spectral distribution of solar radiation, direct & diffuse radiation, measurement of solar radiation and measuring instruments. Solar radiation geometry, solar angles, estimation of average solar radiation, radiation on tilted surface, tilt factors

[8 Hrs]

UNIT II

Solar flat plate collectors: Types of collectors, liquid flat plate collectors, solar air heaters, transmissivity of glass cove(system, collector efficiency, analysis of flat plate collector, fin efficiency, collector efficiency factor and heat removal factor, selective surfaces, evacuated collectors, novel designs of collector

[7 Hrs]

UNIT III

Concentrating collectors: line focusing, point focusing and non focusing type, central receiver concept of power generations compound parabolic collector, comparison of flat & concentrating collectors.

Applications of solar energy to water heating, space heating, space cooling, drying, refrigeration, distillation, pumping. Solar furnaces, solar cookers, solar thermal electric conversion, solar photo- voltaics

Solar energy storage, sensible, latent and thermochemical storage, solar pond

[8 Hrs]

UNIT IV

Biogas :- Introduction, bio gas generation, fixed dome & floating drum biogas plants, their constructional details, raw material for biogas production, factors affecting generation of biogas and methods of maintaining biogas, production, digester design considerations, fuel properties of biogas and utilisation of biogas. Bio Mass :- Introduction, methods of obtaining energy from biomass, Incineration, pyrolysis, gasification, classification of gasifiers & constructional details, chemistry of gasification, fuel properties, applications of gasifiers.

[7 Hrs]

UNIT V

Wind and Ocean energy :-

Power in wind, forces on blades, wind energy. Basic principle of wind energy conversion, site selection consideration, wind data and energy estimation, basic components of WECS, Classification of WEC systems, savonius and darrieus rotars, applications of wind energy.

Ocean energy: Introduction :- ocean thermal electric conversion, open and closed cycle of OTEC, hybrid cycle, energy from tides, basic principles of tidal power & components of tidal power plants, single & double basin arrangement, estimation of tidal power and energy. Energy from ocean waves -energy availability, wave energy conversion devices

[8 Hrs]

UNIT VI

Geothermal and MHD power generation :

Geothermal energy: Introduction, classification of geothermal systems vapour dominated, liquid dominated system, total flow concept, petrothermal systems, magma resources, applications of geothermal operational & environmental problems.

Magneto Hydro Dynamic power generation: Introduction principles of MHD power generation, MHD open and closed systems, power output from MHD generators, design problems of MHD generation, gas conductivity, seeding

[7 Hrs.]

TEXT BOOKS

Energy Technology -Parulekar & Rao
Non Conventional Energy Sources -G D Rai

REFERENCE BOOK

(1) Solar Energy -S.P. Sukhatme
(2) Solar Energy -Duffie & Beckman
(3) Solar energy engg.- Jui sheng Hsieh

7ME2 ELECTIVE – I PROJETCT EVALUATION & MANAGEMENT

UNIT I

Need analysis, market survey, characteristics of market, sample survey, demand forecasting, secondary data, accuracy, confidence level, uncertainty.

[7 Hrs.]

UNIT II

Technical feasibility : Process selection, Level of automation, plant capacity, acquiring technology, Appropriate technology, plant location, Equipment selection & procurement, Govt. policies.

[7 Hrs.]

UNIT III

Economic feasibility : Cost of Project, working capital analysis, fixed cost, means of finance, estimation of sales & production price analysis, Break even point, Projected cash flow statements, projected balance sheet, projected profit & loss statement, projected cash flow, rate of return, Discounted payback period, cost benefit analysis, return after taxes.

[9 Hrs.]

UNIT IV

Project Planning & Control : CPM, PERT, Optimum project duration, resource allocation, updating.

[7 Hrs.]

UNIT V

Project report : Preparation of project report, risk analysis, sensitivity analysis, methods of raising capital.

[7 Hrs.]

UNIT VI

Project review :
Initial review, performance analysis , ratio analysis, sickness, project revival, environ- mental & social aspects.

[8 Hrs.]

RECOMMENDED BOOKS

1. Projects, Prasanna chandra, Tata mc graw Hill publishing company Ltd
2. CPM & PERT, Shrinath, East West publisher
3. Projects, P.K. Joy, Macmillon
4. Engineering Economy H. G Thuesen, W J Fabricky, G.J Thuesen Printce Hall of India Pvt. Ltd.

7ME2 ELECTIVE – I : MATERIAL HANDELING SYSTEM

UNIT I

Types of intraplant transporting facility, principal groups of material handling equipments, choice of material handling equipment, hoisting equipment, screw type, hydraulic and pneumatic conveyors, general characteristics of hoisting machines surface and overhead equipments, general characteristics of surface and overhead equipments and their applications. Introduction to control of hoisting equipments

[8 Hrs.]

UNIT II

Flexible hoisting appliances like ropes and chains, welded load chains, roller chains selection of chains, hemp rope and steel wire rope, selection of ropes, fastening of chains and ropes, different types of load suspension appliances, fixed and movable pulleys, different types of pulley systems, multiple pulley systems, Chain and rope sheaves and sprockets.

[10 Hrs.]

UNIT III

Load handling attachments, standard forged hook, hook weights, hook bearings, cross piece and casing of hook, crane grab for unit and piece loads, carrier beams and slings, load platforms and side dump buckets, electric lifting magnets, grabbing attachments for loose materials, crane attachments for handling liquid materials.

[7 Hrs.]

UNIT IV

Arresting gear, ratchet type arresting gear, roller ratchet, shoe brakes and its different types like electromagnetic, double shoe type, thruster operated, controlled brakes, shoe brakes, thermal calculations of shoe brakes and life of linings, safety handles, load operated constant force and variable force brakes, general theory of band brakes, its types and construction.

[10 Hrs.]

UNIT V

Different drives of hoisting gears like individual and common motor drive for several mechanisms, travelling gear, travelling mechanisms for moving trolleys and cranes on runway rails, mechanisms for trackless, rubber-tyred and crawler cranes, motor propelled trolley hoists and trolleys, rails and travelling wheels, slewing jib and luffing gears. Operation of hoisting gear during transient motion, selecting the motor rating and determining braking torque for hoisting mechanisms, drive efficiency calculations, selecting the motor rating and determining braking torque for travelling mechanisms, slewing mechanisms, jib and luffing mechanisms. (Elementary treatment is expected)

[8 Hrs.]

UNIT VI

Cranes with rotary pillar, cranes with a fixed post, jib cranes with trolley, cranes with luffing boom, cantilever cranes, cage elevators, safety devices of elevators, belt and chain conveyors and their power calculations, vibrating and oscillating conveyors, pneumatic and hydraulic conveyors, screw conveyors, hoppers, gates and feeders. Introduction to AGV's as new material handling device, use of robot for material handling.

[7 Hrs.]

Text Book

1. Materials Handling Equipment- N. Rudenko , Envee Publishers, New Dehli
2. Materials Handling Equipment- M.P. Alexandrov, Mir publications, Maskow

7ME2 ELECTIVE – I ADVANCED I. C. ENGINES

UNIT I

Engines types and their operation
Introduction and Historical Perspective

ENGINE CLASSIFICATIONS

Engine operating cycles
Engine components
Engine friction, lubrication and cooling, lubrication systems.
Frictional losses, blow by losses, pumping loss.
Factors affecting mechanical friction

[8 Hrs]

UNIT II

AUTOMOTIVE FUELS

S.I. Engine fuels characteristics
C.I. Engine fuels characteristics
Rating of engine fuels. I.C. engine fuels – petrol, diesel, CNG, LPG, Alcohols, Vegetable oils fuel supply system. S. I. Engine. Carburetors, modern carburetor S.P.F.I. MPFI direct injection.
C.I.Engine: Fuel injection pump, reciprocating rotary, fuel injector, High presser D.I. systems, fuel distribution systems.

[7Hrs.]

UNIT III

S. I. Engine
Charge motion within the cylinder swirl, squish, combustion stages, flame propagation ,cyclic variations in combustion, ignition fundamentals, conventional ignition system, abnormal combustion, knock and surface ignition, knock fundamentals, turbocharging supercharging and scavenging in engines.

[7 Hrs.]

UNIT IV

C. I. Engines
Combustion in direct and indirect injection, fuel spray behaviour, combustion in C. I. Engines, ignition delay, auto ignition, Factors affecting delay, Effects of fuel properties Abnormal combustion, supercharging and turbocharging in engines.

[7 Hrs.]

UNIT V

Stratified charge engine, free piston engine, adiabatic engines.
Pollutant formation & Control

Nature and extent of problem, Nitrogen oxides
Kinetics of NO formation, formation of NO_2
NO formation in S. I. Engines
NOx formation in C. I. Engine
Carbon monoxide and unburned hydrocarbon emissions in S.I. and C.I. engines
EGR Particulate emissions, measurement technique.
Catalytic converters, particulate traps. [8 Hrs.]

UNIT VI

Engine Design and Operating Parameters

Important engine characterstics, Geometrical properties of Reciprocating engines, Brake, Torque & Power, Indicated work per cycle. Mechanical efficiency, Road load power, Mean effective pressure. Specific fuel consumption and efficiency, Air/Fuel and Fuel/Air ratios. Volumetric efficiency. Engine specific weight and specific volume. Correction factors for power and efficiency. Specific emission and emission index. Relatiosnip between performance parameters

Measurement and Testing

Measurement of friction power indicated power. Brake power. Fuel consumption. Air consumption, Performance parameters and characteristics: Engine Power. Engine efficiencies. Engine performance characteristics. Variables affecting performance characteristics

TEXT BOOK

Internal Combustion Engine Fundamentals - John B. Heywood
Internal Combustion Engines and Air pollution - Edward F. Obert

REFERENCE BOOKS

Internal Combustion Engines - V. Ganesan
Internal Combustion Engines - V. M. Domkundwar
Internal Combustion Engines - M. C. Mathur. R.D. Sharma

7ME3 ELECTIVE – II : FINITE ELEMENT METHODS

UNIT I

Fundamentals of stress & strain, stress & strain components, stress strain relationship, Elastic constants, plane stress, plane strain., differential equation of equilibrium compatibility equations, boundary conditions, Saint Venant's principle, Airy's stress function.

[7 Hrs]

UNIT II

Fundamental concepts of FEM -' Historical background, Scope of FEM in Engg Applications, Principle of minimum potential energy. Concept of Virtual work Raleigh-Ritz method. FEM analysis procedure. .

Mathematical understanding required for FEM, Matrix algebra & operations eigen values & eigen vectors. Methods for solution of simultaneous equations like Gauss elimination. Matrix decomposition method.

Concept of discritization of body into elements, degrees of freedom, bandwidth, Basic types of 2-D & 3-D elements, displacement models, convergence requirements, shape functions. Commercial FE Software's.

[7Hrs]

UNIT III

Finite element modeling & analysis using Bar & Beam element -stiffness matrix assembly, boundary conditions, load vector, temperature effects.

Two dimensional plane 'b11ss -Local & Global coordinate system element stiffness matrix, assembly, boundary conditions, load vector force & stress calculations

[8 Hrs]

UNIT IV

Two dimensional problems using CST & LST -formulation of CST & LST elements, elemental stiffness matrix, assembly, boundary conditions, load vector, stress calculation. Temperature effect

Axi-symmetric solids subjected to axi-symmetric loading -axi-symmetric formulation using CST ring, element, stiffness matrix, boundary conditions, load vector, calculation of stresses.

[8 Hrs]

UNIT V

Introduction to Isopearametric & Higher order elements. Introduction to Numerical Integration.

Introduction to dynamic analysis, formulation of mass matrix for one-dimensional bar element, free vibration analysis using one-dimensional bar element. Torsion of prismatic bars using triangular elements.

[7Hrs]

UNIT VI

Steady state one dimensional & two dimensional heat conduction problems using I-D and triangular element respectively

Programming aspects of FEM -Algorithms for, reading Finite Element modeling data, formation of elemental stiffness matrix, formation of elemental load vector. assembly of individual elemental spiffiness matrix into global' stiffness' matrix. assembly of individual elemental load vector into global load vector. application of boundary .conditions, solution of equations. determination of stresses and strains Pre & Post processing in FEA

[8 Hrs]

TEXT BOOKS

1. Introduction to Finite Elements in Engineering -T R. Chandrupatla & AD Belegundu

2. Theory of Elasticity -S.P. Timoshenko
3. Concept and applications of Finite element Analysis -RD Cook
4. The Finite Element Method -A basic introduction for engineers -D. W. Griffitns, D.A Nethercot –
Granada Publishing

LIST OF PRACTICAL

Students should use the commercial software or programmes from the text-books or self developed programs, to verify the results obtained by manual calculations. The input data and output results of the problem solved using the computer programs, should be included in the Journal

1. Any two problem using bar element
2. Any two problems using truss element
3. Any two problems using CST element
4. Any one problem using axisyrmnetric element
5. Any one problem of free vibration analysis using bar element
6. Any one problem of Torsion of Prismatic bars
7. Any one problem on Steady State Heat conduction.

LIST OF TUTORIALS

Two tutorials on each unit .

7ME3 **ELECTIVE-II : COMPUTER INTEGRATED MANUFACTURING SYSTEM**

UNIT I

Introduction: Fixed, Programmable and Flexible Automation. Classification of automated manufacturing systems based on product variety & production volume. Difference between Automation and CIMS.

Evolution of CIM, Segments of CIM - Computer aided Design, Computer Aided Manufacturing, Computer controlled business functions. Overview of CIM softwares.

[5 Hrs.]

UNIT II

CAD : Fundamentals of CAD – Design process, Product design and development through CAD and CAE. Geometric Modelling Techniques – wire frame modelling, surface modelling, solid modelling, graphic standards. Concept of Concurrent Engineering.

Introduction to CAD softwares – Facilities available in CAD software

[6 Hrs.]

UNIT III

Introduction to flexible manufacturing systems. Subsystems of FMS. Types of FMS layouts.

Introduction to NC, CNC, DNC, Adoptive control systems, constructional and operational features, CNC manual part programming.

- Introduction to automated material handling equipments: Conveyors, monorails, carts wire guided, vehicle, AGV
- Introduction to robots & their applications in manufacturing.
- Introduction to Automated inspection devices: Coordinate Measuring Machine (CMM), Inspection probes etc.
- Automated storage & retrieval systems.

[12 Hrs.]

UNIT IV

Manufacturing Planning.

Automated process planning: Process planning, general methodology of group technology, part identification and coding.

- Retrieval & Generative CAPP systems. Introduction to process planning softwares
- Forecasting, Master production schedule, Materials requirement planning, Capacity requirement planning, Production planning

[6 Hrs.]

UNIT V

Manufacturing system control: Computerized statistical process control, Shop floor control, Shop floor data collection techniques, CAQC, Bill of materials.

Business functions: Purchase orders receiving, inventory management Financial control, Job costing, Sales & Marking applications

[8 Hrs]

UNIT VI

Simulation: Need of simulation, Simulation languages & Packages, Simulation methodology. Types of simulation approaches- Even Scheduling Approach (ESA), Activity scanning Approach (ASA), Process Interaction Approach (PIA)

- Interfacing requirements for integrating manufacturing systems. [6 Hrs.]

TERM WORK

1. Introduction to CAD Softwares
2. Program for generation of any surface
3. Generation of one simple solid model using any CAD Software
4. Manual part programming on CNC Lathe/CNC milling. Drilling
5. Introduction to CAM Softwares
6. Exercise on group technology. Part coding
7. Computer Aided Process Planning
8. Computer Aided Quality Control
9. Study of computer controlled business functions
10. Simulation of CNC Lathe/CNC Mill
11. Study of interfacing requirements in CIMS
12. Study & Demonstration on Robots

RECOMMENDED BOOKS

1. Mikell P. Groover, "Automation, Production Systems and Computer Integrated Manufacturing", Prentice Hall publication 1997
2. P.Radhakrishnan, "CAD, CAM, CIM", New Age International Pvt. Ltd. and S.Subramanyam, Wiley Eastern Ltd.
3. David Bedworth, Etal, "Computer Integrated Design and Manufacturing. McGraw Hill Book Co., 1991.
4. Mikell P. Groover and Zimmers E.W. "Computer Aided Design and Manufacturing", Prentice Hall Publication.

REFERENCE BOOKS

1. Eric Teicholz and Joel orr, "Computer Integrated Manufacturing Hand book. McGraw Hill Book Co., 1989.
2. Paul G. Ranky, "Computer Integrated Manufacturing", 1985.
3. Ibrahim zeid, " CAD/CAM – theory & practice" . Tata McGraw Hill Publication.
4. P.N. Rao, N.K. Tewari and T.K.Kundra, "Computer Aided Manufacturing", Tata McGraw Hill Publication.
5. Nanua Singh, "Systems Approach to Computer Integrated Design and Manufacturing", John wiley publication (1996)
6. Yoram Koven, "Computer Control of Manufacturing Systems" McGraw Hill Publication.

7ME3 ELECTIVE – II INDUSTRIAL FLUID POWER

UNIT I

Fluid power systems: Components, advantages, applications in the field of M/c tools, material handling, hydraulic presses, mobile & stationary machines, clamping & indexing devices etc. Transmission of power at static & dynamic states.

Types of Hydraulic fluid petroleum based, synthetic & water based. Properties of fluids. Selection of fluids, additives, effect of temperature & pressure on hydraulic fluids. Seals, sealing materials, selection of seals. Filters, strainers, sources of contamination of fluid & its control.

JIC symbols/ISO Symbols for hydraulic & pneumatic circuits.

[8 Hrs.]

UNIT II

PUMPS: Types, classification, principle of working & constructional details of vane pump, gear pumps, radial & axial plunger pumps, power and efficiency calculations, char, Curves, selection of pumps for hydraulic power transmission.
ACCUMULATORS & INTENSIFIERS: Types & functions of accumulators, intensifiers, applications, selection & design procedure.

[7 Hrs.]

UNIT III

CONTROL OF FLUID POWER: Necessity of pressure control directional control, flow control valves, Principle of pressure control valves, direct operated, pilot operated, relief valves, pressure reducing valve, sequence valve & methods of actuation of valves.

FLOW CONTROL VALVES: Principle of operation, pressure compensated, temp. compensated flow control valves, meter in & meter out flow control circuits, bleed off circuits.

DIRECTION CONTROL VALVES: Check valves, types of D.C. valves:- Two way two position, four way three position, four way two position valves, open center, close center, tandem center valves, method of actuation of valves, manually operated, solenoid operated, pilot operated etc.

[8 Hrs.]

UNIT IV

ACTUATORS: Linear & Rotary actuators, Hydraulic motors-Types, vane, gear piston, radial piston. Methods of control of acceleration types of cylinder & mountings, calculations of piston velocity, thrust under static & dynamic applications. Design consideration for cylinders.
Hoses & Pipes: Types, materials, pressure drop in hoses/pipes.
Hydraulic piping connections.

[7 Hrs.]

UNIT V

DESIGN OF HYDRAULIC CIRCUITS:

- Meter in meter out circuits
- Pressure control for cylinders
- Flow divider circuits

Circuit illustrating use of pressure reducing valves, sequencing valve counter balance valves, unloading valves with the use of electrical controls accumulaters etc. Maintenance, trouble shooting & safety precautions of Hy Circuits.

[7 Hrs.]

UNIT VI

Pneumatics: Introduction to pneumatic power sources. e.g. reciprocating & rotary compressors, roots-blower etc. Comparison of pneumatics with Hydraulic power transmission. Air preparation units, filters, regulators & lubricators. Actuators linear, single & double acting, rotary actuators, air motors, pressure regulating valves, Directional control valves two way, three way & four way valves, solenoid operated, push button; & lever control valves. Flow control valves. Check valves methods of actuation, mech, pneumatic & electrical etc.
Pneumatic circuits for industrial applications & automation. Eg. Feeding, clamping, indexing, picking & placing etc.

[8 Hrs]

TEXT BOOKS

1) Introduction to Fluid Power By Sahashtrabudhe. Nirali Prakashan Pune
2) Industrial Hydraulics By J.J. Pipenger. mcgraw Hill Co.
3) Pneumatics circuits By D.S. Mujumdar

REFERENCE BOOKS

1) Pinches, "Industrial Fluid Power:, Prentice Hall
2) Vickers manuals on Industrial Hydraulics
3) H.L. Stewart, "Hydraulics & Pneumatics". Industrial Press
4) Yeaple, " Fluid Power Design Handbook".

PRACTICALS :- Minimum eight practicals to be conducted /studied

1) Study of JIC/ISO symbols for Hydraulics and Pneumatics
2) Study of hydraulic pumps
3) Study of various valves used in hydraulic circuits
4) Study of accumulators and Intensifiers
5) Study of different flow control methods
6) Study of various industrial hydraulic circuits (three to four applications)
7) Study of various industrial hydraulic circuits (another three to four applications)
8) Study of FRL unit and valves used in pneumatics
9) Study of industrial pneumatic circuits (three to four app.)
10) Study of hydraulic fluids and fluid seals used in hydraulic systems
11) Syllabus for Seventh Semester B. E. (Mechanical Engineering)

7ME3 ELECTIVE – I I MANAGEMENT INFORMATION SYSTEM

UNIT I

Introduction to MIS;

System & Its components, System Concepts, system control, Types of systems, Date & Information, Nature and scope, Character Function & Applications system life cycle design.

[7 Hrs.]

UNIT II

System Analysis:

System planning, Information Gathering, Structure Analysis tools Feasibility Study, cost/benefit analysis.

[8 Hrs.]

UNIT III

System Design:

Stages of system Design, Input/Output & form design, Database Design Design Documentation.

[8 Hrs.]

UNIT IV

SYSTEM IMPLEMENTATION & EVALUATION

System testing, Implementation Detailed evaluation, System maintenance.

[6 Hrs.]

UNIT V

DECISION SUPPORT SYSTEM :

Concepts & Philosophy of DSS, Deterministic System, Artificial Intelligence(AI) knowledge Based Expert system(KBES).

[8 Hrs.]

UNIT VI

MIS TOOLS & PACKAGES/AREAS OF MIS

ERP(Enterprise Resource Planning)
SCM(Supply Chain arrangement)
CRM(Customer Relation argt.)
Concept of data ware housing and data mining

[8 Hrs.]

PRACTICALS

Inventory control, MRP, Office Automation by using:MS-Access, Visual Basic, Oracle or any other database Languages.

REFERENCE BOOKS

1. MIS by WS Jawadekar
2. MIS by D. P. Goyal
3. System Analysis and Design by Elias M. Awad
4. System Analysis and Design – by Don Yeales.

7ME3 ELECTIVE – I I STRESS ANALYSIS

UNIT I

Two Dimensional Problems in. Cartesian Coordinate system -Fundamentals of stress & stram. stress-strain relationship. Elastic constant. plane stress. plane stram., differential equation of equilibrium Boundary conditions. Saint Venant's principle. compatibility equation. Airys stress function. Stress analysis of cantilever subjected to concentrated load at it's end and simply supported beam subjected to uniformly distributed load

[8 Hrs]

UNIT II

Two dimensional problem in polar coordinate systems -General equations of equilibrium in polar coordinate compatibility equation. stress distribution about symmetric. axis, stress analysis of cylinder subjected to ~ internal & external pressure, Pure bending of curved beams, effect of hole on the stress distribution in plates, Stress analysis of rotating circular disk.

[7 Hrs]

UNIT III

Two Dimensional Photoelasticity - Introduction to basic optics related to photoelasticity. stress optic law. plane & circular polariscope arrangements. effect of stressed model in plane & circular polariscope. Isoclinic & Isochromatics. stress trajectories calibration of photoelastic material (determination of fringe constant) various photoelastic materials and their properties. Casting of photoelastic models. Tardy's compensation technique. Separation techniques like. shear difference. oblique incidence & electrical analogy

[8Hrs]

UNIT IV

Introduction to 3-D photoelasticity -Phenomenon of Stress freezing. Method of stress freezing, slicing techniques, determination of material fringe constant at critical temperature.

Scaling Model- Prototype relations. .

Birefringerent coating method -Reflection polariscope.

Introduction to fringe sharpening & fringe multiplication.

[7 Hrs]

UNIT V

Strain gage technique for stress & strain analysis -Introduction to electrical resistance strain gage gage factor, bridge circuit, bridge balance, output voltage of Wheatstone bridge balancing of bridge temperature compensation, various bridge configurations, bonding of strain gages to the specimen, determination of principle strains & stresses using strain rosettes Environmental effects on performance of strain gages. Strain gages response to dynamic strains Effect of lead wires.

Introduction to Strain measurement on rotating components Static & Dynamic Strain Calibration, introduction to semiconductor gages, high temperature strain gages & self temperature compensated gages. Introduction to Commercial strain indicators.

[8 Hrs.]

UNIT VI

Grid technique of strain analysis, Brittle coating method for stress & strain analysis, Moire fringe method for stress & strain analysis.

[7Hrs.]

TEXT BOOKS

1. Theory of Elasticity -S.P. Timoshenko
2. Experimental Stress Analysis -Dally & Riley
3. Experimental Stress Analysis -T.K. Ray
4. Experimental Stress Analysis -L.S. Srinath

LIST OF PRACTICAL

1. Casting of Photoelastic Sheet
2. Preparation of Circular Disk or any model from photoelastic sheet
3. Determination of fringe constant using circular disk.
4. Determination of stresses using atleast three photoelastic models
5. Seperation of Principle Stresses using any method of stress separation
6. Stress freezing of photoelastic model
7. Fixing of strain gages to the specimen
8. Stress & strain measurement in cantilever beam using strain gages
9. Study & demonstration of Reflection Polariscope
10. Study & demonstration of Fringe sharpner & multiplier

LIST OF TUTORIAL

Two tutorials on each unit

7ME3 ELECTIVE – II : REFRIGERATION & AIR CONDITIONING

UNIT I

REFRIGERATION:

Introduction, Definition, Applications.

STUDY OF SIMPLE VAPOUR COMPRESSION REFERIGERATION SYSTEM:

Analysis of simple vapour compression refrigeration system, effect of subcooling, superheating, polytropic compression & pressure drops on the performance of the system.

STUDY OF VAPOUR ABSORPTION REFRIGERATION SYSTEM

Introduction Ammonia-Water, Lithium bromide-water systems, three fluid refrigerator.

REFEGERANTS:

Nomenclature of refrigerants, refrigerant properties, mixture refrigerants, global warming potential & Ozone depletion potential, Montreal & Kyoto protocol alternate refrigerants.

[8 Hrs]

UNIT II

MULTISTAGE VAPOUR COMPRESSION REFRIGERATION SYSTEMS

Multiple compressor & multiple evaporator systems, cascade refrigeration systems. Study of equipments such as compressors, evaporators, expansion devices & controls defrosting methods (types & principle only). Testing & charging of refrigeration systems.

[8 Hrs]

UNIT III

OTHER REFRIGERATION TECHNIQUES:

Air cycle refrigeration, Applications in air refrigeration systems Vortex tube thermoelectric refrigeration.

CRYOGENICS:

Introduction, Application of cryogenics, Joule- Thomson coefficient, inversion curve, methods of liquefaction of air.

[7 Hrs]

UNIT IV

PSYCHROMETRY:

Introduction, psychometric properties of air, psychometric chart, psychometric processes bypass factor, apparatus dew point temperature

HUMAN COMFORT:

Mechanism of body heat losses, factors affecting human comfort, effective temperature, comfort chart.

[7 Hrs]

UNIT V

ADVANCED PSYCHROMETRY:

Application of psychrometry to various air-conditioning systems, RSHF, GSHF, ESHF, air washers, air coolers.

HEAT LOAD CALCULATIONS:

Data collection for load calculation, various components of heat load estimate method of cooling load calculation.

[8 Hrs]

UNIT VI

AIR TRANSMISSION & DISTRIBUTION:

Principle of air distribution, types of grills & diffusers & their selection criteria, air altration, types of air filters, distribution of air through ducts pressure losses in ducts, methods of duct design, duct friction chart, air conditioning controls

[7 Hrs]

PRACTICALS:

[Minimum seven experiments to be performed / demonstrated / studied]

1. Demonstration of use of various tools and equipments used by a refrigeration mechanic.
2. Study of various types of compressors
3. Study of various condensers, evaporators, expansion devices used in refrigeration systems.
4. Study of demonstration of various controls used in refrigeration and air conditioning.
5. Study of demonstration of miscellanecus refrigeration devices such as vortex tube, Thermoelectric Cooler, Cascade Refrigeration Unit etc.
6. Study & demonstration of window air conditioner / packaged A/c / automotive/ A/c system.
7. To perform experiments on vapour compression test rig to determine COP of the system.
8. To perform experiments on Air-conditioning test rig.
9. To perform experiments on desert cooler to evaluate its performance.
10. Demonstration of charging a vapour compression refrigeration system.
11. Report on visit to air-conditioning or cold storage plant or ice liqualification plant.
12. Study of a central A/c plant
13. Study of Demonstration of domestic freeze.
14. Exercises on computer assisted cooling load calculation
15. Exercises on computer assisted duct design.

TEXT BOOKS:

i. A text book of Refrigeration & Air-conditioning by R.S. Khurmi & J.K. Gupta - S. Chand Pub.

ii. Refrigeration & Air-conditioning by Dr. P.L. Ballany -- Khana Pub.

iii. Refrigeration & Air-conditioning by Dr.C.P. Arora-TMH Pub.

iv. Refrigeration & Air-conditioning by Dr. Manohar Pressed new Age Int. Pub

v. Refrigeration & Air-conditioning by S.V. Domkundwar- Dhanpat Rai & Sons Pub.

REFERENCE BOOKS:

i. Refrigeration & Air-conditioning by Stocker & Jones – McGrawi-Hill Publication
ii. Principle of Refrigeration & Air-conditioning by Roy J Dossat Pearson Edu.
iii. Refrigeration & Air-conditioning by Jordon & Priestar – PHI Publication.
iv. Thermal Environmental Engg. by James Throlkeld
v. Modern refrigeration Practice by Guy R King
vi. Modern Air-conditioning Practice by Harris- McGrawi-Hill Publication
vii. ASHRAE hand books - McGrawi-Hill Publication
viii. Carrier's air-conditioning design data book - McGrawi-Hill Publication
ix. Air conditioning Principles & System. Energy approach by E G Pita Pearson.
x. Audels Series on Air-conditioning. Home Refrigeration & Air-conditioning and commercial Refrigeration – D.B. Taraporewala & Sons.
xi. Principles of Refrigeration by Marsh Olive – CES Publication
xii. Principle of Air-conditioning by Paul Lang – CES Publication
xiii. Basic Refrigeration& Air-conditioning by P.N. Ananthnarayanan - TMH Publication.

7ME4 ENERGY CONVERSION-II

UNIT I

Positive displacement Compressors

Reciprocating compressors: - Parts, Operations, Work done during isothermal polytropic &adiabatic compression process, Pv diagram, isothermal efficiency, Effect of clearance, volumetric efficiency, Mechanical efficiency, Multistage compressor, condition for minimum work input, capacity control, Actual indicator diagram.

[8 Hrs.]

UNIT II

Rotary compressors: -

Rotary &vanes blower and screw.compressor: -

Principle, operation, parts, indicator diagram, workdone, Rodts efficiency, vanes efficiency. (No analytical treatment expected)

Centrifugal compressor:

Principle, operation, parts, velocity diagram, static& total head quantities, work done by impeller,isentropic efficiency of compressor, slip factor,pressure coefficient,power input factor.

Axial flow compressor:

principle, operation, parts, velocity diagram, workdone, Degree of reaction stage efficiency compressor characteristics, surging&chocking, Poly tropic efficiency.

[8 Hrs.]

UNIT III

I.C.Engines:

Air standard &fuel air cycles,parts of I.C.Engines, working of I.C. Engines Two stroke & four stroke I.C Engines SI & CI engines, Introduction to combustion in SI & CI engine, carburetion & fuel injection. (Analytical treatment not expected)

[8 Hrs.]

UNIT IV

I.C.Engine Testing:

Measurement of power: indicated,friction &brake power,measurement of speed fuel & air consumption.calculation of indicated &brake thermal efficiency,volumetric efficiency,mechanical efficiency,percentage of excess air,Heat balance sheet,performance characteristics &factors influencing the performance of I.C.Engines.

[8 Hrs.]

UNIT V

Gas Turbines:

Ideal cycles isentropic and small stage efficiency, application of gas turbine pressure losses, effect of intercooling, reheat & regeneration,fuel-air ratio,combustion efficiency performance calculation, open cycle &closed cycle gas turbine plants co-generations &combined power cycles.

[8 Hrs.]

UNIT VI

JET PROPULSION:

principles &working of turbojet,tuboprop,Ramjet &pulse jet simple turbojet cycle,Thrust power,propulsive power.Thermal efficiency propulsive efficiency, overall efficiency. [5 Hrs.]

TEXT BOOKS

1] Thermal Engineering :BY P.L.Ballaney
2] Thermal Engineering : BY R.Yadav.
3] Heat power engg.: BY Kumar & Vasandani.
4] IC Engine by : V. Ganeshan
5] Gas turbine & Jet Propulsion: Khajuria & Dubey

REFERENCE BOOKS

1] Gas Turbine Theory—By Cohen & Rogers.
2] Internal Combustion Engines –By E.O. Obert

PRACTICALS

Minimum eight practicals to be conducted
1] Trial on steam turbine plant
2] Technical report on visit to thermal power plant.
3] Trial on reciprocating compressor
4] Trial on rotary compressor.
5] Study of internal combustion engines
6] Study of fuel injection and ignition systems
7] Performance testing of a single cylinder I.C. Engine
8] Study of engine cooling and lubrication systems
9] Trial on multicylinder Petrol Engine with energy balance sheet.
10] Heat balance on Multicylinder Diesel Engine
11] Morse test on multicylinder I.C. engine
12] Study of gas turbines
13] Study of Carburettors such as zenith, carter, soles, S.U. etc.
14] Study of cogeneration GT Plant and jet propulsion systems

7ME5 MACHINE DESIGN- III

UNIT I

Coupling: Types of shaft coupling, design of flange coupling, flexible bush coupling.

Flywheel : Coefficient of fluctuation of energy and Coefficient of fluctuation of speed, energy store in flywheel, stresses in flywheel, design of flywheel

[7 Hrs]

UNIT II

Surface finish, friction wear, lubrication, oil seals, design of journal bearings for radial and thrust loads, selection of ball and roller bearing for radial and thrust loads. Failures of antifriction bearing, design of hydrostatic pocket type thrust bearing such as circular step thrust bearing, bearing housing.

[7 Hrs]

UNIT III

Flat belt dive : Types of belts & belt material, analysis of belt tension, condition for transmitting maximum power, design of flat belt, flat belt pulley

V belt drive : Types of V-belt, analysis of V-belt tension, design of V belt pulley

Roller change drive : Velocity ratio and length of chain, design of chain dimensions of tooth profile, sprocket.

[8 Hrs.]

UNIT IV

Review of Kinematics of gears & terminology, interference, tooth profiles, formative number of teeth etc. Bukingham equation, design of spur gear drive, helical gear drive

[8 Hrs]

UNIT V

Worm gear drive : Types and proportion of worm and worm gear, force analysis, beam strength of worm gear teeth, dynamic tooth load, wear load, thermal rating of worm gear, design of worm and worm gear.

Bevel gear drive : Types of bevel gear, proportions of bevel gear, force analysis of bevel gear drive design of bevel gear drive.

[8 Hrs]

UNIT VI

Introduction to haulage system, design of wire rope, sheave and drums

Electric motor rating, types of motor like AC, DC, their Characteristics, controls, selection motors.

[7 Hrs]

LIST OF PRACTICALS

Numerical problem (at least 10 problems should be included in the Journal]

1. Design of fly wheel
2. Design of coupling
3. Design of Journal Bearing
4. Design of Selection Antifriction bearing
5. Design of Belt drive
6. Design of chain drive
7. Design of wire rope
8. Design of Gear drive

Each students shall submit two assembly design report along with the drawing for assembly/sub assemembly for any mechanical system consisting of not less than four members included in the syllabus

TEXT BOOKS

1. Mechanical Design of Machine	Maleev Hartman
2. Machine Design	P.H. Black
3. Mechanical Engg. Design	Shigley
4. Design Data book	B.D. Shiwalkar
5. Design of Machine Elements	V. B. Bhandari
6. Design of Machine Elements (Theory & Problems)	B.D. Shiwalkar

REFERENCE BOOKS

1. Hard book of Machine Design	-	Shiglay & Mischke
2. Mechanical Engineering Hard book ▸ Vol 1 & 2	-	Kent
3. Design Data Book	-	PSG Tech. Coimbatore
4. Machine Tool Design Data Book	-	CMTI

7ME6

PROJECT SEMINAR

It is expected to select project topic as per the guidelines of the project to be undertaken in the 8th semester. Also it is expected to carry out the Literature survey for their project work and finalize the methodology and schedule of the project . Each student of the concerned project batch shall work on approved project topic under the Project guide and shall present a seminar using audio-visual aids of about 15 minute duration on their project methodology and schedule of completion. Seminar delivery will be followed by question -- answer session. The students shall also be required to submit in advance a detailed type written report on his work.

A committee of staff members called "seminar Committee" shall be constituted for the purpose of evaluating the seminar.;