TME 701
COMPUTER AIDED DESIGN (CAD)

UNIT – I

Introduction and review of computer programming:

Introduction to CAD/CAE, Element of CAD, Concepts of integrated CAD/CAM, CAD Engineering applications, its importance & necessity. Review of C, C++, statements such as if else for while & switch, functions, pointer-notations, structure & class, concept of OOP. **5**

Computer Graphics –I

Computer systems, Graphics input devices- cursor control devices, Digitizers, Scanners, speech oriented devices and touch panels, Graphics display devices – CRT, colour CRT monitors, DVST, Flat- panel display, Graphics output Devices. **3**

UNIT-II

Computer Graphics-II

Graphics software, Graphics functions, output primitives- Bresenham's line drawing and Mid-point circle algorithms. **3**

Geometric Transformations

Word/device co-ordinate representations, 2D and 3D geometric transformations, Matrix representation-translation, scaling, shearing, rotation and reflection, composite transformations, concatenation, rotation about arbitrary axis. Exercise and programs**.** **5**

UNIT –III

Plane Curves:

Curve representation, Interpolations Vs approximation, Parametric Continuity conditions, Spline Curves- Hermite spline, Bezier spline and B- spline Curves and its Properties. **4**

3-D Graphics:

Polygon surfaces – Polygon mesh representations, Quadric and Superquardic surfaces and Blobby objects, Fractals. Solid modeling- wire mesh and sweep representation, constructive solid geometry, Boolean operations, Boundary representations. Colour models. **4**

UNIT – IV

Computer Aided Design of Machine Elements and other Systems:

CAD of machine elements such as shaft, springs, bearings and problems from other systems such as heat exchanger, inventory control etc. Writing Computer program in C, Drafting/Design of software such as Auto-CAD and Pro-E. **7**

UNIT – V

Numerical Methods:

Introduction, Errors in numbers, Binary, octal and Hexadecimal number representation. Root-finding & Optimisation. Interactive methods- Bisection method, Regula-Falsi method, Newton Raphson method, Interpolation- Lagrange and Newton's interpolation, Curve fitting-Least Square method, Numerical differentiation-interpolation methods, Numerical integration- Trapezoidal and Simpson Method. **6**

Finite Element Methods

Introduction and Application of FEM, Stiffness Matrix/ Displacement Matrix, One/Two Dimensional bar & beam element (as spring system) analysis. **3**

Books/References

1. Computer Graphics by Hearn & Baker (Pearson / Prentice hall)
2. Computer Aided Design by R.K.Srivastava.
3. Computer Graphics –Theory & Practice- Foley, Van Dam, Feiner, (Pearson Education)
4. CAD/CAM Theory and Practice – Ibrahim Zeid (Mc Graw Hill International)
5. Computer Aided Analysis & Design of Machine Elements (Rao & Dukkipati)
6. Mathematical Elements for Computer Graphics – Rogers & Adams (Mc Graw Hill)
7. C AD/CAM – Groover & Zimmers (Prentice Hall of India Pvt Ltd)
8. Computer Oriented Numerical Methods – Rajaraman (Prentice Hall)
9. FEM – SS. Rao.

TME-702
COMPUTER AIDED MANUFACTURING (CAM)

Unit-I

1. Introduction

Introduction to Automation and need and future of NC systems and CAM. Advantages & disadvantages. Classification. Open and closed loop systems. Historical development and future trends. 4

2. Features of NC Machines-

Difference between ordinary and NC machine tools. Methods for improving Accuracy and Productivity. 3

Unit-II

3. NC Part Programming-

(a) Manual (word address format) programming. Examples Drilling and Milling. 4

(b) APT programming. Geometry, Motion and Additional statements, Macro- statement. 5

Unit-III

4. System Devices- Introduction to DC motors, stepping motors, feed back devices such as encoder, counting devices, digital to analog converter and vice versa. 3

5. Interpolators- Principle, Digital Differential Analysers. Linear interpolator, circulator Interpolator and its software interpolator. 4

6. Control of NC Systems- Open and closed loops. Automatic control of closed loops with encoder & tachometers. Speed variation of DC motor. Adaptive control. 3

Unit-IV

7. Computer Integrated Manufacturing system- Group Technology, Manufacturing cell, Transfer lines, FMS, CIM, CAD/CAM, CAPP, Concept of Mechatronics & MEMS. 6

Unit-V

8. Robotics- NC machine vs Robots. Types and generations of Robots. Robot applications. Economics, Robot programming methods. VAL and AML with examples. 6

9. Intelligent Manufacturing

Introduction to Artificial Intelligence for Intelligent manufacturing. 2

Books/References-

1. Computer control of Manufacturing systems by Koren
2. Robots by Koren
3. NC Machines by Koren
4. CAD/CAM by Groover.
5. NC Machine Tools by S.J. Martin.

TME-703
AUTOMOBILE ENGINEERING

Unit-I

Power Unit and Gear Box :

Principles of Design of main components. Valve mechanism. Power and Torque characteristics. Rolling, air and gradient Resistance. Tractive effort. Gear Box. Gear ratio determination. Design of Gear box. 7

Unit-II

Transmission System :

Requirements. Clutches. Toque converters. over Drive and free wheel, Universal joint. Differential Gear Mechanism of Rear Axle. Automatic transmission, Steering and Front Axle. Castor Angle, wheel camber & Toe in Toe out etc.. Steering geometry. Ackerman mechanism, Understeer and Oversteer. 8

Unit-III

Braking System :

General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes. Vaccum and air brakes. Thermal aspects. 5

Chasis and Suspension System :

Loads on the frame. Strength and stiffness. Various suspension systems. 3

Unit-IV

Electrical System :

Types of starting motors, generater & regulators, lighting system, Ignition system , Horn, Battery etc. 5

Fuel Supply System :

Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburator etc. MPFI. 4

Unit-V

Automobile Air Conditioning:

Requirements, Cooling & heating systems 2

Cooling & Lubrication System :

Different type of cooling system and lubrication system. 2

Maintenance system :

Preventive maintenance, break down maintenance, and over hauling system. 2

References-

1. Automotive Engineering- Hietner
2. Automobile Engineering - Kripal Singh.
3. Automobile Engineering - Narang.
4. Automotive Mechanics- Crouse
6. Automobile Engineering - Newton and Steeds.

TME-751

CAD/CAM Lab

Say 10 experiments

(6 from CAD experiments, 4 from CAM experiment)

A. CAD Experiments-

1. Line drawing or Circle drawing algorithm experiment : writing the program and running it on computer.
2. Transformations algorithm experiment for translation/rotation/scaling : writing program and running it on computer.
3. Design problem experiment : writing the program for design of machine element or other system and running it on computer.
4. Optimisation problem experiment : writing a program for optimising a function and runing it on computer.
5. Auto CAD experiment : understanding and use of Auto CAD commands.
6. Writing a small program for FEM for 2 spring system and running it. Or using a FEM package.
7. Use of Graphic software standards packages e.g. GKs/PHICS/GL etc.
8. Use of pro Engineer/Ideas etc.

B. CAM experiments-

1. Writing a part-programming (in word address format or in APT) for a job for drilling operation (point-to-point) and running on NC machine.
2. Writing a part programming (in word address format or in APT) for a job for milling operation (contouring) and running on NC machine
3. Experiment on Robots and it programs

4. Experiment on Transfer line/Material handling.
5. Experiment on difference between ordinary machine and NC machine, study or retrofitting.
6. Experiment on study of system devices such as motors and feed back devices.
7. Experiment on Mechatronics & controls.

ME-753
AUTOMOBILE ENGG. -LAB

Say any10 study & exp. from the following or such experiments)

1. Study & experment on braking system.
2. Study & experiment on fuel supply system.
3. Study & experiment on ignition system.
4. Study & experiment on steering system.
5. Study & experiment on transmission system.
6. Study & experiment on suspension system.
7. Study safety aspect of automobile design.
8. Study & experiment on Lighting or lubrication system.
9. Study & experiment on lubrication and cooling system.
10. Comparative study features of common small cars (such as fiat, Ambassador, Maruti, Matiz, Santro, Indica and its variations) available in India.
11. Comparative study & technical features of common scooters & motorcycles available in India. Case study/term paper.
12. Comparative Study & Technical features of common heavy vehicles available in India. Case study/term paper.
13. Engine tuning and carburator servicing experiment.
14. Experiment & study of MPFI system.
15. Experiment on fuel consumption measurement.
16. Review experiment on IC Engines & modern trends.
17. Visit of an Automobile factory.
18. Study & experiment of main gear box and differential gear box.

TME-801
POWER PLANT ENGINEERING

Unit-I

Introduction

Power and energy, sources of energy, review of thermodynamic cycles related to power plants, fuels and combustion, calculations. 3

Variable Load problem

Industrial production and power generation compared, ideal and realised load curves, terms and factors. Effect of variable load on power planoperation, methods of meeting the variable load problem. 2

Power plant economics and selection

Effect of plant type on costs, rates, fixed elements, energy elements, sustomer elements and investor's profit; depreciation and replacement, theory of rates. Economics of plant selection, other considerations in plant selection. 3

Unit-II

Steam power plant

Powerplant boilers including critical and super critical boilers. Fluidized bed boilers, boilers mountings and accessories. General layout of steam power plant. Different systems such as fuel handling system, pulverizers and coal burners, combustion system, draft, ash handling system, feed water treatment and condenser and cooling system, turbine auxiliary systems such as governing, feed heating, reheating , flange heating and gland leakage. Operation and maintenance of steam power plant, heat balance and efficiency. 8

Unit-III

Diesel power plant

General layout, performance of diesel engine, fuel system, lubrication system, air intake and admission system, supercharging system, exhaust system, diesel plant operation and efficiency, heat balance. 2

Gas turbine power plant

Elements of gas turbine power plants, Gas turbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication, operation and maintenance, Combined cycle power plants. 6

Unit-IV

Nuclear power plant

Principles of nuclear energy, basic components of nuclear reactions, nuclear power station. 3

Hydro electric station

Principles of working, applications, site selection, classification and arrangements, hydro-electric plants, run off size of plant and choice of units, operation and maintenance, hydro systems, interconnected systems. 4

Non Conventional Power Plants

Introduction to non-conventional power plants (Solar, wind, geothermal, tidal)etc. 2

Unit-V

Electrical system

Generators and generator cooling, transformers and their cooling, bus bar, etc. 2

Instrumentation

Purpose, classification, selection and application, recorders and their use, listing of various control rooms. 3

Pollution

Pollution due to power generation 2

References

1. "Power Plant Engineering" F.T. Morse, Affiliated East-West Press Pvt. Ltd, New Delhi/Madras.
2. "Power Plant Engineering" Mahesh Verma, Metropolitan Book Company Pvt. Ltd. New Delhi.
3. "Power Plant Technology" El-Vakil, McGraw Hill.
4. Power Plant Engineering by P.K. Nag, Tata McGraw Hill.
5. Steam & Gas Turbines & Power Plant Engineering by R.Yadav, Central Pub.House.

TPI 801
QUALITY CONTROL

Unit-I

Introduction : Concept and evoluation of quality control. Measurement & Metrology, precision vs accuracy. Process capability, standrdisation & Interchangeability. 3

Inspection and Gauges : Inspection methods. Types of Gauges. Limits Fits and Tolerances. Non-Destructive Testings & Evaluation. 5

Unit-II

Control Charts for SQC : Statistical Quality Control (SQC). Control charts for variables such as X, R charts and control charts for attributes such as p-chart, c-chart. Construction & use of the control charts. Process capability. 8

Unit-III

Acceptance Sampling for SQC : Principle of acceptance sampling. Producer's and consumer's risk. Sampling plans –single, double & sequential. Sampling by attributes and variables. 7

Unit-IV

Reliability : Introduction to reliability, bath-tub curve. Life expectancy. Reliability based design. Series & Parallel System. 3

Defect Diagnosis and prevention : Basic causes of failure, curve/control of failure. **MTBF.** Maintainability, Condition monitoring and dignostic techniques. 4

Value Engineering : Elements of value analysis, Techniques. 2

Unit-V :

TQM : Inspection, Quality control , Quality Assurance and Quality Management and Total Quality Management. Implementation of TQM . ISO 9000 and its series, Zero defect. Quality circle . Taguchi method. Six sigma concept. 5

Other Factors in Quality : Human Factors such as attitude and errors. Material-Quality. Machine Capability and Manufacturing process limitations. Quality in sales & service. Methods for improving accuracy & quality. Quality Circle. 3

Reference:

1. Statistical Quality Control by Grant and Leavarworth, McGraw Hill
2. Maintenance for Reliability by Rao.

TME-802
MECHANICAL SYSTEMS DESIGN

UNIT I

Engineering Process and Systems Approach:

Basic concepts of systems, attributes characterizing a system, system types. Application of systems concepts in Engineering, advantages of systems approach, basic problems concerning systems. Concurrent Engineering. A case study: e.g. viscous lubrication system in wire drawing**.** **4**

Problem Formulation:

Nature of engineering problems, Needs statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraints. A case Study: e.g. heating duct insulation – system high- speed belt drive system. **4**

UNIT II

System Theories:

System analysis, Black Box approach, state theory approach, component integration approach, Decision process approach; A case study : e.g. automobile instrumentation panel system. **4**

System Modeling:

Need of modeling, Model types and purpose, linear systems, mathematical modeling, Concepts; A case study: e.g. A compound bar system. **4**

UNIT III

Graph Modeling and Analysis:

Graph Modeling and analysis process, path problem , Network flow problem, A case study: e.g. material handling system. **4**

Optimization Concepts:

Optimization process, selection of goals and objectives- Criteria, methods of optimization analytical, combinational, subjective. A case study: e.g. aluminium extrusion ion system. **3**

UNIT IV

System Evaluation:

Feasibility assessment, planning horizon, time value of money, financial analysis. A case study: e.g. manufacture of a Maize-Starch system. **4**

Calculus Methods for optimization:

Model with one decision variable, model with two decision variables, model with equality constraint, Model with inequality constraint. A case study: e.g. optimization of an insulation – system. **4**

UNIT-V

Decision Analysis:

Elements of a decision problem, decision making, under certainty, uncertainty risk and conflict Probability density function, Expected monetary value, utility value, Baye's theorem: A case study: e.g. Installation of a Machinery. **4**

System Simulation:

Simulation concepts, simulation models, computer applications in simulation, spread sheet simulation. Simulation process, problem definition, input model construction and solution, limitations of simulation approach. A case study: e.g. An inventory control in a Production – Plant. **5**

REFERENCES:

1. Design And Planning of Engineering Systems – by D.D.Reredith, K.V.Wong, R.W.Woodhead, and R.R.Worthman, Prentice Hall Inc., Englewood Cliffs, New Jersey.
2. Design Engineering- by J.R.Dixon, Tata Mc Graw Hill Publishing Company, New Delhi.
3. An Introduction to Engineering Design Method – by V.Gupta and P.N. Murthy, Tata Mc. Graw Hill.
4. Engineering Design – Robert Matousck, Blackie and Son Ltd., Glasgow.
5. Optimisation Techniques – S.S.Rao.
6. System Analysis and Project Management- Devid I. Cleland, William R.King, Mc Graw Hill.

TME-803
PROJECT MANAGEMENT

Unit-I :Project Management Concepts:

Introduction, project characteristics, taxonomy of projects, project identification and formulation. Establishing the project and goals. Nature & context of project management; phases of PM, A framework for PM issues, PM as a conversion process, project environment & complexity. Organizing human resources, organizing systems & procedures for implementation. Project direction. **8**

Unit-II : Project Organization & Project Contracts:

Introduction, functional organization, project organization, matrix organization, modified matrix organization, pure project organization, selection of project organization structure, project breakdown structures, project contracts, types of contracts, types of payments to contractors. **8**

Unit-III : Project Appraisal & Cost Estimation:

Introduction, technical appraisal, commercial appraisal, economic appraisal, financial appraisal, management appraisal, social cost/benefit analysis, project risk analysis. Cost analysis of the project, components of capital cost of a project, modern approach to project performance analysis. **8**

Unit-IV: Project Planning & Scheduling:

Introduction to PERT & CPM, planning and scheduling networks, time estimation, determination of critical path, CPM model, event slacks & floats, PERT model, expected time for activities, expected length of critical path, calculating the project length and variance, PERT & CPM cost accounting systems, lowest cost schedule, crashing of networks, linear programming formulation of event oriented networks, updating of networks, LOB technique. **8**

V- Modification & Extensions of Network Models:

Complexity of project scheduling with limited resources, resource leveling of project schedules, resource allocation in project scheduling - heuristic solution.

Precedence networking- examples with algorithm, decision networks, probabilistic networks, computer aided project management- essential requirements of PM software, software packages for CPM. Enterprise-wide PM, using spread sheets for financial projections. 8