Course Structure – Mechanical Engineering

IV Year

Semester: VII

S. No.	Paper Code	Subject Name	Teaching Scheme			Credits
		Theory	**L**	**T**	**P**	
1	EME-701	Computer Aided Design	3	1	0	4
2	EME-702	Automobile Engineering	3	1	0	4
3	EOE-071/074	Open Elective – I $	2	1	0	3
4	EME-071/074	Departmental Elective – II **	3	1	0	4
5	EME-171/174	Departmental Elective – III ***	3	1	0	4
Practical						
1	EME-751	Computer Aided Design Lab	0	0	3	2
2	EME-752	Automobile/ IC Engine Lab	0	0	3	2
3	EME-753	Seminar on Industrial Training Report - II	0	0	3	2
4	GP-701	GP	-	-	-	0
		Total	**14**	**5**	**9**	**25**

Semester: VIII

S. No.	Paper Code	Subject Name	Teaching Scheme			Credits
		Theory	**L**	**T**	**P**	
1	EME-801	Power Plant Engineering	3	1	0	4
2	EME-802	Mechanical System Design	3	1	0	4
3	EOE-081/084	Open Elective – II#	3	1	0	4
4	EME-181/184	Departmental Elective – IV ##	3	1	0	4
Practical						
1	EME-851	Project	0	0	3	8
2	GP-801	GP	-	-	-	0
		Total	**12**	**4**	**3**	**24**

$ Open Elective – I

1. **EOE-071** Industrial Ergonomics
2. **EOE-072**Quality Management
3. **EOE-073** Non-conventional energy Resources
4. **EOE-074** Numerical Methods in Engineering

**** Departmental Elective – II**

1. **EME-071**CAM
2. **EME-072**Project Management
3. **EME-073** Non Destructive Testing
4. **EME-074**Advanced Fluid Mechanics

***** Departmental Elective – III**

1 **EME-171** Design of Thermal System
2 **EME-172** Advanced Material Technology
3 **EME-173** Advanced Dynamics of Machinery
4 **EME-174**Automation & Robotics

Departmental Elective – IV

1. **EME-181** Production Planning & Control
2. **EME-182** Principles of Machine Tool Design
3. **EME-183** Concurrent Engineering
4. **EME-184** Maintenance Engineering

#Open Elective – II

1. **EOE-080** Total Quality Management
2. **EOE-082**Management Information System
3. **EOE-083** Production & Operation Management
4. **EOE-084** Six Sigma Methods

EME-701: COMPUTER AIDED DESIGN (CAD)

L T P
3 10

UNIT-I

Introduction: Introduction to CAD/CAED/CAE, Elements of CAD, Essential requirements of CAD, Concepts of integrated CAD/CAM, Necessity & its importance, Engineering Applications

Computer Graphics-I CAD/CAM systems, Graphics Input devices-cursor control Devices, Digitizers, Keyboard terminals, Image scanner, Speech control devices and Touch, panels, Graphics display devices-Cathode Ray Tube, Random & Raster scan display, Colour CRT monitors,

Direct View Storage Tubes, Flat Panel display, Hard copy printers and plotters

UNIT-II

Computer Graphics-II Graphics standards, Graphics Software, Software Configuration, Graphics Functions, Output primitives- Bresenham's line drawing algorithm and Bresenham's circle generating algorithm

Geometric Transformations: World/device Coordinate Representation, Windowing and clipping, 2 D Geometric transformations-Translation, Scaling, Shearing, Rotation & Reflection Matrix representation, Composite transformation, 3D transformations, multiple transformation

UNIT-III

Curves: Curves representation, Properties of curve design and representation, Interpolation vs approximation, Parametric representation of analytic curves, Parametric continuity conditions, Parametric representation of synthetic curves-Hermite cubic splines-Blending function formulation and its properties, Bezier curves-Blending function formulation and its properties, Composite Bezier curves, B-spline curves and its properties, Periodic and non-periodic B-spline curves

UNIT-IV

3D Graphics: Polygon surfaces-Polygon mesh representations, Quadric and Superquadric surfaces and blobby objects; Solid modeling-Solid entities, Fundamentals of Solid modeling-Set theory, regularized set operations; Half spaces, Boundary representation, Constructive solid geometry, Sweep representation, Color models Application commands for AutoCAD &ProE software

UNIT-V

Numerical Methods: Introduction, Errors in numbers, Binary representation of numbers, Root finding- Bisection method, Newton Raphson method, Curve fitting-Least square method, Numerical differentiation-Newton's interpolation, Numerical Integration-Trapezoidal and Simpson method

Finite Element Method: Introduction, Principles of Finite elements modeling, Stiffness matrix/displacement matrix, Stiffness matrix for spring system, bar & beam elements, bar elements in 2D space (truss element)

Books & References:

1. Computer Graphics Hearn & Baker Prentice Hall of India
2. Computer Aided Engineering Design AnupamSaxena& B. SahayAnamaya Publishers
3. CAD/CAM HP Groover& EW Zimmers, Jr. Prentice Hall India Ltd.
4. CAD/CAM Theory and Practice Ibrahim Zeid& R Sivasubramaniam McGraw Hill

EME -702: AUTOMOBILE ENGINEERING

L T P
3 1 0

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.

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.

Unit-III

Braking System: General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes.Vacuum and air brakes.Thermal aspects.

Chasis and Suspension System: Loads on the frame. Strength and stiffness.Various suspension systems.

Unit-IV

Electrical System : Types of starting motors, generator & regulators, lighting system, Ignition system, Horn, Battery etc.

Fuel Supply System: Diesel & Petrol vehicle system such as Fuel Injection Pump, Injector & Fuel Pump, Carburetor etc. MPFI.

Unit-V

Automobile Air Conditioning: Requirements, Cooling & heating systems.

Cooling & Lubrication System: Different type of cooling system and lubrication system.

Maintenance system: Preventive maintenance, break down maintenance and over hauling.

References- 1. Automotive Engineering- Hietner , 2. Automobile Engineering - Kripal Singh.

EME-751: CAD/CAM LAB

L T P
0 0 3

Total 10 Experiments are to carried out. FIVE Experiments each from CAD and CAM.

A. CAD Experiments

1. Line Drawing or Circle Drawing experiment: Writing and validation of computer program.
2. Geometric Transformation algorithm experiment for translation/rotation/scaling: Writing and validation of computer program.
3. Design of machine component or other system experiment: Writing and validation of computer program.
4. Understanding and use of any 3-D Modeling Software commands.
5. Pro/E/Idea etc. Experiment: Solid modeling of a machine component
6. Writing a small program for FEM for 2 spring system and validation of program or using a fem Package
7. Root findings or curve fitting experiment: Writing and validation of computer program.
8. Numerical differentiation or numerical integration experiment: Writing and validation of computer program.

B. CAM Experiments

1. To study the characteristic features of CNC machine
2. Part Programming (in word address format) experiment for turning operation (including operations such as grooving and threading) and running on CNC machine)
3. Part Programming (in word address format or ATP) experiment for drilling operation (point to point) and running on CNC machine
4. Part Programming (in word address format or ATP) experiment for milling operation (contouring) and running on CNC machine
5. Experiment on Robot and programs
6. Experiment on Transfer line/Material handling
7. Experiment on difference between ordinary and NC machine, study or retrofitting
8. Experiment on study of system devices such as motors and feed back devices
9. Experiment on Mecatronics and controls

EME-752: I.C. ENGINES AND AUTOMOBILE LAB

L T P
0 0 3

Minimum 10 experiments out of following in depth and details.

1. Performance Analysis of Four stroke S.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.
2. Determination of Indicated H.P. of I.C. Engine by Morse Test.
3. Performance Analysis of Four stroke C.I. Engine- Determination of indicated and brake thermal efficiency, specific fuel consumption at different loads, Energy Balance.

4. Study & experiment on Valve mechanism.
5. Study & experiment on Gear Box.
6. Study & experiment on Differential Gear Mechanism of Rear Axle.
7. Study & experiment on Steering Mechanism.
8. Study & experiment on Automobile Braking System.
9. Study & experiment on Chassis and Suspension System.
10. Study & experiment on Ignition system of I.C. Engine.
11. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI.
12. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
13. Study & experiment on Air Conditioning System of an Automobile.
14. Comparative study of technical specifications of common small cars (such as Maruti Swift, Hyundai i20, CheverletAveo, Tata Indica, Ford Fusion etc.
15. Comparative study & technical features of common scooters & motorcycles available in India.
16. Visit of an Automobile factory.
17. Visit to a Modern Automobile Workshop.
18. Experiment on Engine Tuning.
19. Experiment on Exhaust Gas Analysis of an I.C. Engine.

Open Elective – II

EME-071: INDUSTRIAL ERGONOMICS

L T P

3 1 0

Unit-I

Introduction: Importance applications and principles of occupational ergonomics.

Physiological Principles: Muscular work, Nervous control of movements, Improving working efficiency. Optimal use of muscleStrength/Guidelines for work layout.

Skilled work: Acquiring skill, control of skilled movements. Design of tools and equipments for skilled work.

Unit-II

Heavy work: Energy consumption, Efficiency, Heart rate as a measure of workload.

Work-station Design: Anthropometric data, Reach and clearance dimensions. Percentiles to be accommodated.

Unit-III

Working Heights: Comfortable working postures. Room to grasp or move things, and operate controls.Sedentary work.Its Advantages, Disadvantages and limitation. Sedentary workplace design.Design of VDT workstations, Design of Key board.

Handling Lads: The Human spine, back troubles associated with industrial work, Intervertebral disc, disc pressure, slip of disc, Bio-mechanical models of lower back. Recommendations for handling loads.

Man-Machine System: Display equipment, Controls, Relation between control and display instruments, Mental activity, Fatigue, Occupational stress, Job design in monotonous task.

Unit-IV

Human Visual System: Accommodation, Aperture of the pupil, Adaptation of reline, eye movements Visual capacity, Visual strain, Physiology of reading.

Ergonomic Principles of Lighting: Light sources, measurement, physiological requirements of artificial lighting, arrangement of light. Light for fine work and for VDT offices.

Unit-V

Noise and Violation: Sound perception, Noise load, damage to hearing, physiological and psychological effects of noise. Protection against noise, Vibrations and their effect on performance.

Working Environment: Thermo-regulation in human body, comfort indoors, Air quality and its dryness, Air pollution and ventilation.Heat in industry Recommendations for comfort indoors.Daylight, colours and music for pleasant work environment.

Books

1. Fitting the task to the Man, E. Gandjean, Taylor and Francis.
2. A guide to Ergonomics of Manufacturing, Helander, M., East-West Press.
3. Human Factor in Engineering and Design, Sanders, M.S., and McCormik, E.J., McGraw.HilL

EOE-072: QUALITY MANAGEMENT

L T P
2 1 0

UNIT-I

Quality Concepts: Evolution of Quality Control, concept change, TQM Modern concept, Quality concept in design, Review of design, Evolution of proto type.

Control on Purchased Product Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

Manufacturing Quality Methods and Techniques for Manufacture, Inspection and Control of Product, Quality in sales and services, guarantee analysis of claims.

UNIT-II

Quality Management Organization structure and design, quality function, decentralization, designing and fitting, organization for different type products and company, economics of quality value and contribution, quality cost, optimizing quality cost, seduction program.

Human Factor in quality

Attitude of top management, cooperation of groups, operators attitude, responsibility, causes of apparatus error and corrective methods.

UNIT-III

Control Charts: Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

Attributes of Control Chart Defects, construction and analysis of charts, improvement by control chart, variable sample size, construction and analysis of C charts.

UNIT -IV

Defects diagnosis and prevention defect study, identification and analysis of defects, correcting measure, factors affecting reliability, MTTF, calculation of reliability, building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

UNIT –V

ISO-9000 and its concept of Quality Management

ISO 9000 series, Taguchi method, JIT in some details.

Text / Reference Books:

1. Lt. Gen. H. Lal, "Total Quality Management", Eastern Limited, 1990.
2. Greg Bounds, "Beyond Total Quality Management", McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992.

EOE-073: NON-CONVENTIONAL ENERGY RESOURCES

L T P
2 1 0

UNIT-I

Introduction: Various non-conventional energy resources- Introduction, availability, classification, relative merits and demerits.

Solar Cells: Theory of solar cells. solar cell materials, solar cell array, solar cell power plant, limitations. 4

UNIT-II

Solar Thermal Energy: Solar radiation, flat plate collectors and their materials, applications and performance, focussing of collectors and their materials, applications and performance; solar thermal power plants, thermal energy storage for solar heating and cooling, limitations.

UNIT-III

Geothermal Energy: Resources of geothermal energy, thermodynamics of geo-thermal energy conversion-electrical conversion, non-electrical conversion, environmental considerations.

Magneto-hydrodynamics (MHD): Principle of working of MHD Power plant, performance and limitations.

Fuel Cells: Principle of working of various types of fuel cells and their working, performance and limitations.

UNIT-IV

Thermo-electrical and thermionic Conversions: Principle of working, performance and limitations.

Wind Energy: Wind power and its sources, site selection, criterion, momentum theory, classification of rotors, concentrations and augments, wind characteristics. Performance and limitations of energy conversion systems.

UNIT-V

Bio-mass: Availability of bio-mass and its conversion theory.

Ocean Thermal Energy Conversion (OTEC): Availability, theory and working principle, performance and limitations.

Wave and Tidal Wave: Principle of working, performance and limitations.

Waste Recycling Plants.

Text/References Books:

1. Raja etal, "Introduction to Non-Conventional Energy Resources" Scitech Publications.
2. John Twideu and Tony Weir, "Renewal Energy Resources" BSP Publications, 2006.
3. M.V.R. KoteswaraRao, " Energy Resources: Conventional & Non-Conventional " BSP Publications,2006.
4. D.S. Chauhan,"Non-conventional Energy Resources" New Age International.

5. C.S. Solanki, “Renewal Energy Technologies: A Practical Guide for Beginners” PHI Learning.
6. Peter Auer, "Advances in Energy System and Technology". Vol. 1 & II Edited by Academic Press.

EOE-074: NUMERICAL METHODS IN ENGINEERING

L T P
2 1 0

Unit-I

Modeling, Computers, and Error Analysis: Mathematical Modeling and Engineering Problem Solving, Approximations and Round-Off Errors, Truncation Errors and the Taylor Series.

Roots of Equations: Bracketing Methods – Bisection Method, False Position Method; Open Methods – Fixed Point Iteration, Newton-Raphson Method, Secant Method; Applications.

Unit-II

Linear Algebraic Equations: Gauss Elimination – Solving Small Numbers of Equations, Gauss-Jordan; LU Decomposition and Matrix Inversion, Special Matrices and Gauss-Seidel, Applications.

Curve Fitting: Interpolation – Newton‟s and Lagrange interpolation polynomials, Applications.

Unit-III

Numerical Differentiation and Integration: Newton-Cotes Integration Formulas – Trapezoidal Rule, Simpson‟s Rules, Integration with Unequal Segments, Open Integration Formulas, Multiple Integrals; Integration of Equations - Gauss Quadrature; Numerical Differentiation – High Accuracy Differentiation Formulas, Richardson Extrapolation, Derivatives of Unequally spaced Data; Applications.

Unit-IV

Ordinary Differential Equations: Runge-Kutta Methods – Euler‟s Method, Improvement of Euler‟s Method, Runge-Kutta Methods, Systems of Equations; Boundary-Value and Eigen value Problems, Applications.

Unit-V

Partial Differential Equations: Finite Difference: Elliptic Equations – The Laplace Equation, Solution Techniques, Boundary Conditions, The Control Volume Approach; Finite Difference: Parabolic Equations – The Heat Conduction Equation, Explicit Methods, Simple Implicit Method, The Crank-Nicolson Method; Applications.

Text Book:

1. Numerical Methods for Engineers, S. C. Chapra and R. P. Canale, Tata McGraw-Hill Company Ltd.

References: 1. Applied Numerical Methods with MATLAB for Engineers and Scientists, S. C. Chapra, McGraw-Hill Company Ltd.
2. Applied Numerical Methods for Digital Computation, M. L. James, G. M. Smith, J. C. Wolford, Harper & Row Publisher

Departmental Elective – II

EME-071: COMPUTER AIDED MANUFACTURING (CAM)

L T P

3 1 0

UNIT-I

Automation Introduction to CAM; Automated Manufacturing system; Need of automation, Basic elements of automation, Levels of automation, Automation Strategies, Advantages & disadvantages of automation, Historical development and future trends.

Features of NC Machines- Fundamental of Numerical Control, elements of NC machine tools, classification of NC machine tools, Advantages, suitability and limitations of NC machine tools, Application of NC system, Methods for improving Accuracy considering the factors such as tool deflection and chatter and Productivity.

UNIT-II

NC Part Programming- (a) Manual (word address format) programming. Examples Drilling, Turning and Milling;Canned cycles, Subroutine, and Macro

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

UNIT-III

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

Interpolators Digital differential Integrator-Principle of operation, exponential decelarion; DDA Hardware Interpolator- Linear, Circular; DDA Software Interpolator.

Control of NC Systems Open and closed loops. Control of point to point systems- Incremental open loop control, Incremental close loop, Absolute close loop; Control loop in contouring systems; Adaptive control.

UNIT-IV

Computer Integrated Manufacturing system Group Technology, Flexible Manufacturing System, CIM, CAD/CAM, Computer aided process planning-Retrieval and Generative, Concept of Mechatronics, Computer aided Inspection.

UNIT-V

Robotics Types and generations of Robots, Structure and operation of Robot, Robot applications. Economics, Robot programming methods.VAL and AML with examples.

Intelligent Manufacturing Introduction to Artificial Intelligence for Intelligent manufacturing.

Books/References-

1. Automation, Production Systems and Computer Integrated Manufacturing by Mikell P. Groover
2. Computer Aided Manufacturing by Kundra and Rao
3. Computer control of Manufacturing systems by Koren
4. NC Machine Tools by S.J. Martin.
5. NC Machines by Koren
6. CAD/CAM by Groover.

EME-072: Project Management

L T P
3 1 0

Unit I

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

Unit II

Project Organization & Project Contracts: Introduction, functional organization, project organization, matrix organization, modifiedmatrix organization, pure project organization, selection of project organization structure,project breakdown structures, project contracts, types of contracts, types of payments tocontractors.

Unit III

Project Appraisal & Cost Estimation: Introduction, technical appraisal, commercial appraisal, economic appraisal, financialappraisal, management appraisal, social cost/benefit analysis, project risk analysis. Costanalysis of the project, components of capital cost of a project, modern approach toproject performance analysis.

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.

Unit V

Modification & Extensions of Network Models: Complexity of project scheduling with limited resources, resource leveling of projectschedules, 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.

Books:

1. Project Management by K. Nagarajan
2. Project Management by Harvey Maylor

EME-073: NON-DESTRUCTIVE TESTING

L T P
3 10

Unit-I

Introduction Scope and advantages of NDT. Comparison of NDT with DT.Some common NDTmethods used since ages, Terminology.Flaws and Defects, Visual inspection,Equipment used for visual inspection. Ringing test chalk test (oil whitening test).
Attractive uses of above tests in detecting surface cracks, bond strength & surface defects.

Unit-II

Common NDT methods Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment &techniques, Tests stations, Advantages, types of penetrant and developers.Illustrativeexamples – Heavy castings of large size, frame of jet engine, porosity testing of nickelalloys, leak testing.Zyglo test

Magnetic particle Inspection – Scope , principle, Ferro Magnetic and Non-ferro magnetic materials, equipment & testing. Advantages, limitations Interpretation of results.DC & AC magnetization, Skin Effect, use of dye & wet powders for magna glow testing, different methods to generate magnetic fields, Applications.

Unit-III

Radiographic methods X-ray radiography principle, equipment & methodology. Applicability, types of radiations,limitations. Interpretation of Radiographs, limitations of γ-ray radiography – principle,equipment.Attenuation of electro magnetic radiations, source of radioactive materials &technique. Photo electric effect, Rayleigh's scattering (coherent scattering), Compton'sscattering (Incoherent scattering). Pair production, Beam geometry, Scattering factor.
Advantages of γ-ray radiography over X-ray radiography Precautions against radiation hazards.Case Study ─ X-ray of human body.

Unit-IV

Ultrasonic testing methods Introduction, Principle of operation, Piezoelectricity. Ultrasonic probes, CRO techniques,advantages, Limitation & typical applications. Applications in inspection of castings,forgings, Extruded steel parts, bars, pipes, rails and dimensions measurements. CaseStudy – Ultrasonography of human body.

Unit-V

Eddy Current Inspection Principle, Methods, Advantages, Scope and limitations. Types of Probes.Case Studies.

References:

(1) ASM Handbook Vol. 11, 8th Edition – Non-destructive Testing & Evaluation
(2) Research Techniques in NDT Vol.3, R.S. Shah, Academic
(3) Industrial Quality Control, Webstar
(4) Bray, Don E. and Stanley, Roderic K., Nondestructive Evaluation: A Tool in Design, Manufacturing, and Service. Revised Edition 1997, CRC Press New York.

EME-074: ADVANCED FLUID MECHANICS

L T P
3 10

UNIT-I

Review of kinematics of fluid motion, method of describing fluid motion, translation, rate of deformation, the material derivatives, acceleration, vorticity in cartesian& polar coordinates, Reynolds transport theorem, Stress at a point, velocity profile, wall shear stress.

UNIT-II

Non-viscous incompressible flow- Equation of continuity, Euler's equation of motion, Bernoulli's equation, circulation and its theorem, stress function, velocity potential, irrotational flow, two dimensional source, sink, source-sink pair, doublet vortex, superposition of source-sink with rectilinear flow, Rankine body, Superposition of rectilinear flow and doublet, flow around a spinning circular cylinder, Magnus effect, lift & Drag, Skin friction. Lift of aerofoils.

UNIT-III

Boundary layer Concept-Introduction to boundary layer formation, Novier-stokes equation, Boundary layer thickness, momentum thickness, energy thickness, Boundary layer equations, Momentum-Integral equation - Von Korman, Blasius solution of boundary layer on a flat plate without pressure gradient, Flow with very small Reynolds number, Hogenpoisseuille flow, Plane Couette flow, Hydrodynamic theory of lubrication.

UNIT-IV

Compressible flow- Propagation of pressure change, sound velocity, elastic waves, Mach number, Mach cone, isentropic flow relations in terms of sonic velocity and mach number, Stagnation properties, Regions of flow, Energy equation, Effect of Mach number on compressibility. Propagation of infinitesimal waves, Non-steep finite pressure wave and steep finite pressure waves, Expansion waves Isentropic flow with variable area, Mach number variation and its effect on Flow through nozzles and diffusers. Area ratio, impulse function, Use of Gas/Air tables.

UNIT-V

Flow with normal shock waves- Development of shock wave, rarefaction wave, governing equations, Prandtle-Meyer relation. Thermodynamic properties across shock.Wind tunnels.

Flow in constant area duct with friction-Fanno curves, Fanno flow equations, Solution of fanno flow equations. Variation of flow properties. Tables & charts for Fanno flow.

Flow in constant area duct with heat transfer- Rayleigh line, Fundamental equations, Rayleigh flow relation, Variation of flow properties. Tables & Charts for Rayleigh flow.

Books/ References:

1. Fluid Mechanics by White.
2. Fluid Mechanics by Streeter
3. Fluid Mechanics by Som&Biswas
4. Fluid Mechanics by K.L. Kumar
5. Fluid Mechanics by A.K. Jain
6. Fluid Mechanics by Robert W. Fox & Alan T. Mc Donald, Wiley Students Edition
7. Fundamentals of Compressible flow by S.M. Yahya

Open Elective – II

EOE-081: TOTAL QUALITY MANAGEMENT (TQM)

L T P
3 1 0

Unit-I

Quality Concepts Evolution of Quality control, concept change, TQM Modern concept, Quality concept in design, Review off design, Evolution of proto type.

Control on Purchased Product Procurement of various products, evaluation of supplies, capacity verification, Development of sources, procurement procedure.

Manufacturing Quality Methods and Techniques for manufacture, Inspection and control of product, Quality in sales and services, Guarantee, analysis of claims.

Unit-II

Quality Management Organization structure and design, Quality function, decentralization, Designing and fitting organization for different types products and company, Economics of quality value and contribution, Quality cost, optimizing quality cost, seduction programme.

Human Factor in Quality Attitude of top management, co-operation, of groups, operators attitude, responsibility, causes of operators error and corrective methods.

Unit-III

Control Charts Theory of control charts, measurement range, construction and analysis of R charts, process capability study, use of control charts.

Attributes of Control Charts Defects, construction and analysis off-chart, improvement by control chart, variable sample size, construction and analysis of C-chart.

Unit-IV

Defects Diagnosis and Prevention Defect study, identification and analysis of defects, corrective measure, factors affecting reliability, MTTF, calculation of reliability, Building reliability in the product, evaluation of reliability, interpretation of test results, reliability control, maintainability, zero defects, quality circle.

Unit-V

IS0-9000 and its concept of Quality Management:

ISO 9000 series, Taguchi method, JIT in some details

References:

1. Lt. Gen. H.LaI, "Total Quality management", Wiley Eastern Limited, 1990. .
2. Greg Bounds. “Beyond Total Quality Management”.McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992

EOE-082: MANAGEMENT INFORMATION SYSTEM

L T P
3 10

Unit-I

Organisation & Types, Decision Making, Data & information, Characteristics & Classification of information, Cost & value of information, Various channels of information & MIS.

Unit-II

Foundation of Information System : Introduction to Information System in Business Fundamentals of Information System, Solving Business Problems with Information System, Concept of Balanced MIS, Effectiveness & Efficiency Criteria. Tool and Techniques of MIS-dataflow diagram, flow chart etc.

Unit-III

Business application of information technology, electronic commerce, Internet, Intranet, Extranet & Enterprise Solutions, Information System for Business Operations, Information system for managerial Decision Support, Information System for Strategic Advantage.

Unit-IV

Managing Information Technology, Enterprise & Global Management, Security & Ethical Challenges, Planning & Implementing Change. Reports: Various types of MIS reports, GUI & Other Presentation tools.

Unit-V

Advanced concepts in information system: Enterprise Resource Planning: introduction, various modules like Human Resources, Finance, Accounting, Production& Logistics. Supply Chain Management, CRM, Procurement Management System Object Oriented modeling case studies.

Books

1. O.Brian, "Introduction to Information System", Mc-Graw Hill.
2. O.Brian, "Management Information System", TMH.
3. Alter, "Information Systems : A Management Perspective", Addison Wesley.
4. Arora& Bhatia, "Information Systems for Managers", Excel
5. Bansal, "Information System Analysis & Design", TMH.

EOE-083: PRODUCTION & OPERATIONS MANAGEMENT

L T P
3 10

Unit –I

Managing Operations Operations Management – Function, Evolution, Definition, Systems view of P&OM; Operations Strategies for Competitive Advantage;

Unit –II

Planning (Designing) the conversion System Designing Products, Services and Processes; Operations Capacity; Locating Production and Service facilities; Layout Planning.

Unit-III

Organizing the conversion System Job design, Production and Operations standards, and work measurement; Project Management.

Unit-IV

Scheduling Production and Service System Scheduling systems, Aggregate Planning for Production and service system; Operations Scheduling.

Unit-V

Material Requirements Planning Planning for needs, applying MRP, Detailed capacity planning, MRP II.

Managing for World class Competition World class Manufacturing practices; Managing for Quality; Conversion Process in change.

READINGS

1) Adam Jr Everett E. R J – Production and Operations Management (Prentice-Hall, 2000, 5th Edition)
2) Russell & Taylor III – Operations Management (Pearson, 4th Edition)
3) Hill T- Operations Management (Palgrave, 2000)
4) McGregor D – Operations Management (McGraw-Hill, 1960)
5) Morton - Production and Operations Management (Vikas)

EOE-084: SIX SIGMA METHODS

L T P
3 1 0

Unit I

Quality Perception; Quality in Manufacturing, Quality in Service Sector; Differences between Conventional and Six Sigma concept of quality; Six Sigma success stories. Statistical foundation and methods of quality improvement.

Descriptive statistics: Data Type, Mean, Median, Mode, Range, Variation, Standard Deviation, Skewness, Kurtosis.

Probability Distribution: Normal, Binomial, Poisson Distribution

Unit II

Basics of Six Sigma: Concept of Six Sigma, Defects, DPMO, DPU, Attacks on X'S, Customer focus, Six Sigma for manufacturing, Six Sigma for service. Z score,

Understanding Six Sigma organization, Leadership council, Project sponsors and champions, Master Black Belt, Black Belt, Green Belts.

Unit III

Methodology of Six Sigma, DMAIC, DFSS, Models of Implementation of Six Sigma, Selection of Six Sigma Projects.

Unit IV

Six Sigma Tools: Project Charter, Process mapping, Measurement system analysis, Hypothesis Testing, Quality Function deployment, Failure mode effect analysis, Design of Experiments.

Unit V

Sustenance of Six Sigma, Communication plan, Company culture, Reinforcement and control, Introduction to softwares for Six Sigma, Understanding Minitab, Graphical analysis of Minitab plots.

References:

1. Six Sigma: SPC and TQM in manufacturing and service, Geoff Tennant, Gower Publishing Co.
2. Six Sigma for managers, Greg Brue, TMH
3. What is Six Sigma, Pete Pande, TMH

4. The Six Sigma Way, Peter S. Pande, TMH Team Field book
5. The Six Sigma way, Peter S. Pande, TMH

EME-801: POWER PLANT ENGINEERING

L T P
3 1 0

Unit-I

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

Load estimation, load curves, various terms and factors involved in power plant calculations.

Effect of variable load on power plant operation, Selection of power plant units. Power plant economics and selection Effect of plant type on costs, rates, fixed elements, energy elements, customer elements and investor's profit; depreciation and replacement, theory of rates.

Economics of plant selection, other considerations in plant selection.

Unit-II

Steam power plant: General layout of steam power plant, Power plant boilers including critical andsuper critical boilers. Fluidized bed boilers, boilers mountings and accessories, Differentsystems such as coal handling system, pulverizers and coal burners, combustionsystem, draft, ash handling system, Dust collection system, Feed water treatment andcondenser and cooling towers and cooling ponds, Turbine auxiliary systems such asgoverning, feed heating, reheating , flange heating and gland leakage. Operation andmaintenance of steam power plant, heat balance and efficiency, Site selection of asteam power plant.

Unit-III

Diesel power plant General layout, Components of Diesel power plant, Performance of diesel powerplant, fuel system, lubrication system, air intake and admission system, superchargingsystem, exhaust system, diesel plant operation and efficiency, heat balance, Siteselection of diesel power plant, Comparative study of diesel power plant with steampower plant.

Gas turbine power plant Layout of gas turbine power plant, Elements of gas turbine power plants, Gasturbine fuels, cogeneration, auxiliary systems such as fuel, controls and lubrication,operation and maintenance, Combined cycle power plants, Site selection of gas turbinepower plant

Unit-IV

Nuclear power plant Principles of nuclear energy, Lay out of nuclear power plant, Basic components ofnuclear reactions, nuclear power station, Nuclear waste disposal, Site selection ofnuclear power plants.

Hydro electric station Hydrology, Principles of working, applications, site selection, classification andarrangements, hydro-electric plants, run off size of plant and choice of units, operationand maintenance, hydro systems, interconnected systems.

Non Conventional Power Plants Introduction to non-conventional power plants (Solar, wind, geothermal, tidal)etc.

Unit-V

Electrical system Generators and generator cooling, transformers and their cooling, bus bar, etc.

Instrumentation Purpose, classification, selection and application, recorders and their use, listingof various control rooms.

Pollution Pollution due to power generation.

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.

EME-802: MECHANICAL SYSTEM DESIGN

L T P
3 1 0

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**.**

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.

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.

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

UNIT III

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

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.

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.

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.

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.

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.

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 McGraw 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, McGraw Hill.

Departmental Elective – III

EME-171: DESIGN OF THERMAL SYSTEMS

L T P
3 1 0

Unit-I

Psychrometry of Air Conditioning Processes, Design Conditions & Load Calculations Psychometric Processes in Air Conditioning Equipments, Analysis of Air Conditioning systems for summer & winter conditions, inside & outside design conditions for comfort, Industrial Air Conditioning.

Cooling & Heating Load calculations- Heat transfer through building structures, solar heat gain, Infiltration & ventilation air, Internal heat gain, Occupancy & Product load, Room sensible heat factor, Effective sensible heat factor & Grand sensible heat factor, capacity of the plant.

Design & Selection of Air conditioning Apparatus Heat & moisture transfer in Air conditioning apparatus, Enthalpy potential, Analysis of Coil & Spray Equipments Design of Cooling & Dehumidifying coils, Design of Air Washer & Cooling Towers.

Unit-II

Analysis of Complete Vapour Compression System – Design and Balancing of System Components

Type of Refrigerant Compressors, Condensers, Evaporators & Expansion devices used in Vapour Compression Refrigeration Cycles, Design and Selection of individual components and their performance characteristics, Use of P-H charts for different Refrigerants in performance predication of the cycle.

Analysis of the complete vapour-compression-system and determination of 'Balance Points' using Graphical and Analytical methods, system simulation.Layout & selection of Refrigerant, water and Brine pipings for the designed system. Selection of Refrigeration and Air conditioning Controls for the system.

Unit-III

Design of Turbomachines: Principles of Design of turbo machines, Design of axial flow turbine stage, Design of axial flow compressor stage, Design of centrifugal compressor.

Unit-IV

Design of Heat Exchanger : Study of design aspects, fluid flow and heat transfer characteristics, Material requirement of heat exchange equipments, Liquid – to liquid and Liquid – to – gas heat exchange systems, Familiarity with use of design related standards and codes, Design of Heat exchanger.

Unit-V

Optimization of design of thermal systems like condenser, evaporator, cooling tower for minimum cost and maximum performance, Development of computer program for design, Environmental consideration in design of thermal systems, Analysis of thermal systems using FEM.

References

1. Refrigeration & Air Conditioning - By C.P. Arora
2. Refrigeration & Air Conditioning - By Manohar Prasad
3. Principles of Refrigeration (S.I.Units) - By Roy J.Dossat
4. Air Conditioning Engineering - By W,P.Jones
5. Heating, Ventilating and Air Conditioning - By McQuistion, Parker &Spitler
6. Refrigeration & Air Conditioning Data Book – Manohar Prasad

EME-172: ADVANCED MATERIALS TECHNOLOGY

L T P
3 1 0

UNIT-I

Introduction to Ferrous Materials Plain carbon steels, their properties and application: plain carbon steels, effects ofalloying elements in plain carbon steels. Alloy steels, tools steels, stainless steels, lowand high temperature resisting steels, high strength steels, selections, specifications,form and availability of steel. Cast irons-white, grey, modular malleable and alloy castirons. Recognised patterns of distribution of graphite flakes in grey cast iron.

UNIT-II

Heat Treatment of Steels TTT diagrams, annealing, normalizing, hardening and tempering of steel. Austemperingand martempering of steel.Surface hardening of steel-Carbonising nitridingcarbonitridingcyniding, flues and inducationhardenirng microscopic determination ofcase depth and depth of hardening.

Unit-III

Nonferrous materials Ultra light materials. Properties and application, brasses, bronzes, cupro-nickel alloys,aluminum, magnesium and titanium alloys, bearing materials. Heat treatment ofnonferrous materials – soputionizing, Aging and precipitations hardening.

Composites Polymer – polymer, metal-metal, ceramic – ceramic, ceramic-polymer, metal-ceramic, metal-polymer composites. Dispersion reinforced, particle reinforced, laminated and fiber reinforced composites.

Refractory materials and coatings for high temperature applications.Smart Materials-introduction, types and applications. Thin film shape memory alloys.

Unit-IV

Biomaterials Classes and application of materials in medicine and dentistry. Stress strain behaviour ofbone. The mechanical properties including elasticity, hardness, viscoelasticity, surfaceand fatigue properties of skin; soft tissues; bone; metals; polymers and ceramics. Biocompatible materials and its applications.The effects of degradation and corrosion.

Unit-V

Nuclear Materials Introduction to nuclear materials. Materials for nuclear fuel in fission and fusion reactors,Fissile and fertile materials.Control & Construction Materials for Nuclear reactors,Moderators, Heat Exchangers.Radiation proof materials.Brief discussion of safety andradioactive waste disposal.

References:

1. Biomaterials Science- An Introduction to Materials in Medicine. Buddy D.Rattner, A.S.Hoffman, F.J. Sckoen, and J.E.L Emons, Academic Press, second edition, 2004.
2. Biomaterials: An Introduction (second edition) JoonB.Park&RodericS.Lakes, Plenum Press, 1992.
3. Handbook of Materials for Medical Devices, Edited by J. R. Davis, ASM international, 2003.
4. Introduction to Nuclear Engineering, by J.R Lamarsh.
5. W.D. Callister, Jr, - Material Science & Engineering Addition-Wesly Publishing Co.

EME-173: ADVANCED DYNAMICS OF MACHINERY

L T P
3 10

UNIT I

Dynamic Analysis of Mechanisms and Machines: Introduction, Motion of Rigid Body under a System of Forces, Principle of Virtual Work, D'Alembert's Principle and Dynamic Equilibrium, Dynamic Force Analysis, Stresses in Moving Members, Motion Analysis, Equivalent Force and Mass Method.

UNIT II

Dynamics of Direct Acting Engine Mechanisms: Introduction, Piston Motion, Turning Moment on Crank-Shaft, Dynamically Equivalent Link, Approximate Expression for Turning Moment, Correction to the Approximate Expression, Turning Moment Diagram, Fluctuation of Crank-Shaft Speed, Flywheel Analysis.

UNIT III

Balancing of Inertia Force and Moments in Machines: Introduction, Balancing of Rotating Masses, Two-Plane Balancing, Determination of Balancing Masses, Balancing of Internal Combustion Engines.

UNIT IV

Gyroscopic action in Machines: Introduction, Motion of a Rigid Body in Three- Dimensions, Principal Axes, Angular Velocity and Momentum about Principal Axes, Euler's Equation of

Motion, Euler's Modified Equation, Simple Precession of a Symmetrical Gyroscope in Angular Precession, Gyroscopic Effects in Machines, Gyroscopic Stabilization.

UNIT V

Dynamics of Rotating Shafts: Introduction, Critical Speed, Shaft with an Unbalanced Disc at Mid-Span, Generalized Forces, Lagrange's Equation of Motion, Gyroscopic Effect on Critical Speed.

Text Book:

1. Theory of Mechanisms and Machines by Amitabh Ghosh and Ashok Kumar Malik, Affiliated East- West Press Pvt. Ltd, New Delhi.
2. Theory of Machines and Mechanisms by Joseph Edward Shigley and John Joseph Uicker, J.R. International Student Edition, Mc-Graw Hill International Company.

EME-174: AUTOMATION & ROBOTICS

L T P
2 1 0

1. Introduction: Definition, Classification of Robots, geometric classification and control classification.

2. Robot Elements: Drive system, control system, sensors, end effectors, gripper actuators and gripper design.

3. Robot Coordinate Systems and Manipulator Kinematics: Robot co-ordinate system representation, transformation, homogenous transform and its inverse, relating the robot to its world.

Manipulators Kinematics, parameters of links and joints, kinematic chains, dynamics of kinematic chains, trajectory planning and control, advanced techniques of kinematics and dynamics of mechanical systems, parallel actuated and closed loop manipulators.

4. Robot Control: Fundamental principles, classification, position, path velocity and force control systems, computed torque control, adaptive control, Seroo system for robot control, and introduction to robot vision.

5. Robot Programming: Level of robot programming, language based programming, task level programming, robot programming synthesis, robot programming for welding, machine tools, material handing, assembly operations, collision free motion planning.

6. Applications: Application of robot in welding, machine tools, material handling, assembly operations parts sorting and parts inspection.

Text/Reference Books:

1. CoifetChirroza, "An Introduction to Robot Technology" Kogan Page.
2. Y. Koren "Robotics for Engineers" Mcgraw Hill.
3. K. S. Fu, R.C. Gonzalez Y& CSG Lee, "Robotics" McGraw Hill.
4. J.J. Craig, "Robotics" Addison-Wesley.

Departmental Elective – IV

EME-181: PRODUCTION PLANNING & CONTROL

L T P
3 1 0

Unit-I

Introduction: Objectives of production planning and control, definitions, functions of production planning and control, organization of production planning and control department, internal organization of department.

Forecasting: Forecasting models, Aggregate production planning, master production scheduling, materials requirements planning.

Unit-II

Inventory Control: Objectives, scope of the problem, economic and social complications of inventory management, control systems approach, limitations of inventory control. Functions of inventory, demand and production characteristics.Measures of inventory performance.

Systematic control of inventory: Fixed order quantity systems, fixed interval systems, (s, S) systems, classification of items in inventory. Computer based inventory control systems.

Unit-III

Cost factor: The importance of costs, elements of costs, principles of cost determination and accounting systems, production and inventory cost factors, other costs to the firm.

Economic quantities of manufacture or purchase: Lot size problems, finite production rates in manufacturing, quantity discounts.

Uncertainty: Effects of uncertainty, demand and supply, safety stock, role of forecasting in production and inventory control. uncertainty in production cycling

Unit-IV

Production planning: Scope of planning, types of production planning, demand analysis, seasonal and non-seasonal demand. Planning procedures.Setting the production rate. Short term and long term planning - make and buy decisions, product design and process selection, manufacturing planning.

Unit-V

Production control: Control objectives, problems in production control, types of production and production control systems, controlling production, routing, scheduling and dispatching. Lay out of the physical system, design of a production planning and control systems. Application of computers in production planning and control.

Text Book:

1. Production planning and inventory control - Magee and Boodman.

References:

1. Production control - John E Biegal.
2. Production forecasting, planning and control - EH Mac Niece.
3. Elements of production planning and control - Samuel Eilon.
4. Production Planning and Inventory Control – Seetharama L Narasimhan, Dennis W, McLeavey, Peter J Billington.
5. Industrial Engineering and Management – O P Khanna.

EME-182: PRINCIPLES OF MACHINE TOOL DESIGN

L T P
3 1 0

Unit-I

Introduction: Developments is machine tools, types of machine tools surface, profits and paths produced by machine tools. Features of construction and operations of basic machine tools e.g. lathe, drill, milling shapes and planers, grinding machine etc.General requirement of machine tool design.Machine tool design process. Tool wear, force Analysis.

Unit-II

Machine Tools Drives: Classification of machine tool drives, group Vs individual drives, Selection of electric motor, A brief review of the elements of mechanical transmission e.g. gear, belt and chain drives, slider-crank mechanism, cam mechanism, nut & Screw transmission, Devices for intermittent motion, reversing & differential mechanisms.

Couplings and clutches Elements of hydraulic transmission system. e.g. pumps, cylinder, directional control valves, pressure valves etc. Fundamentals of Kinematics structure of machine tools.

Unit-III

Regulation of Speed and Feed rates: Laws of stepped regulation, selection of range ratio, standard progression ratio, selection of best possible structural diagram, speed chart, Design of feed box, Developing gearing diagrams. Stepless regulation of speed and feed in machine tool, speed and feed control.

Unit-IV

Design of Machine Tool Structure: Requirements and design criteria for machine tool structures, selection of material Basic design procedure for machine tool structures, design of bed, column and housing, Model technique in design.

Design of guideways and power screws: Basic guideway profiles, Designing guideway for stiffness a wear resistance & hydrostatic and antifriction guideways. Design of sliding friction power Screws. Design of spindlier & spindle supports.

Layout of bearings, selection of bearings machine tools

Unit-V

Dynamics of machine tools: General procedure for assessing the dynamic stability of cutting process, closed loop system, chatter in machine tools

Control Systems: Functions, requirements & types of machine tool controls, controls for speed & feed change. Automatic and manual Controls.Basics of numerical controls.Machine tool testing.

Books :

1. Machine Tools Design & Numerical Controls –N.K. Mehta, T.M.H. New Delhi.
2. Design of Machine Tools – S.K. Basu Allied Publishers.
3. Principles of Machine Tools, Bhattacharya A and Sen.G.C. New Central BookAgency.

EME-183: CONCURRENT ENGINEERING

L T P
3 1 0

Unit-I

Introduction: Background and challenges faced by modern production environment, sequentialengineering process, Concurrent engineering definition and requirement, meaning ofconcurrent objectives of CE, benefits of CE, Life cycle design of products, life cyclecosts.

Support for CE Classes of support for CE activity, CE organizational, structure CE, teamcomposition and duties, Computer based Support, CE Implementation Process.

Unit-II

Design Product for Customer Industrial Design, Quality Function Deployment, house of quality, Translationprocess of quality function deployment (QFD).

Modeling of Concurrent Engineering Design Compatibility approach, Compatibility index, implementation of the Compatibility model, integrating the compatibility Concerns.

Unit-III

Design for Manufacture (DFM) Introduction, role of DFM is CE, DFM methods, e.g. value engineering, DFM guidelines,design for assembly, creative design methods, product family themes, design axioms,

Taguchi design methods, Computer based approach to DFM. Evaluation of Manufacturability and Assemblability.

Unit-IV

Quality by Design Quality engineering & methodology for robust product design, parameter and Tolerancedesign, Quality loss function and signal to noise ratio for designing the quality,experimental approach.

Unit-V

Design for X-ability Design for reliability, life cycle serviceability design, design for maintainability,design for economics, decomposition in concurrent design, concurrent design casestudies.

Books:

1. Concurrent Engineering Kusiak John Wiley
2. Concurrent Engineering Menon Chapman & hall

EME-184: MAINTENANCE ENGINEERING

L T P
3 1 0

Unit-I

Introduction, operating life cycle, reliability, Failure data analysis, failure rate curve, hazard models, elements in series, parallel, mix, logic diagrams, improving reliability, redundancy-element, unit, standby, maintainability, availability, reliability and maintainability trade off.

Unit-II

Maintenance Strategies: Break down maintenance, planned maintenance, strategies, preventive maintenance, design out maintenance, planned lubrication, total productive maintenance, zero break down, preventive inspection of equipment used in emergency.

Unit-III

Replacement planning maintain or replace decision, replacement of items that deteriorate identical equipment, replacement of items that fail without deterioration individual, group replacement, replacement in anticipation of failure.

Unit-IV

Break down maintenance planning, assignment model, waiting time models expected waiting time, minimum cost service rate, PERT.

Unit-V

Maintenance Management, production maintenance system, objectives and functions, forms, policy, planning, organization, economics of maintenance, manpower planning, materials planning, spare parts planning and control, evaluation of maintenance management.

Books:

1. Management of systems – R.N. Nauhria& R. Prakash.
2. Operations Research – Wangner.