

UNIVERSITY OF LUCKNOW
Faculty of Engineering and Technology
Branch: Mechanical Engineering
Evaluation Scheme for B. Tech.

SEMESTER- VIII

Sr. No.	Subject Code	Subject Name	L-T-P	Evaluation					Credit
				Sessional			ESE	Grand Total	
				CA	TA	Total			
Theory									
01	OE 80XX	Any One from the Open Elective List	3--1--0	20	10	30	70	100	4
02	ME-801X	Any One from the List (DE-3)	3--1--0	20	10	30	70	100	4
03	ME 802	Automobile Engineering	3--1--0	20	10	30	70	100	4
04	AS 801/ AS 802	Engineering Economics/ Industrial Management	3--0--0	20	10	30	70	100	3
Practical									
05	ME 851	Automobile Engineering Lab	0--0--2	-	20	20	30	50	1
06	ME 852	Project	0--0--12	-	-	100	250	350	8
07	GP 801	General Proficiency				50		50	
Total				12--3-14				800	24

Abbreviations:

CT- Class Test TA- Teacher's Assessment
 ESE- End Semester Examination DE- Departmental Elective

Departmental Elective (DE-3):

1. ME-8011 Advance Welding
2. ME-8012 Energy Conservation and Management
3. ME-8013 Total Quality Management
4. ME-8014 Theory of Elasticity
5. ME-8015 Advanced Production Engineering

Open Electives: Refer list of Open Electives in APPENDIX.

ME-701
REFRIGERATION & AIR CONDITIONING

L T P
3 1 0

UNIT-I

08

Refrigeration: Introduction to refrigeration system, Methods of refrigeration, Carnot refrigeration cycle, Unit of refrigeration, Refrigeration effect & C.O.P.

Air Refrigeration cycle: Open and closed air refrigeration cycles, Reversed Carnot cycle, Bell Colemanor Reversed Joule air refrigeration cycle, Aircraft refrigeration system, Classification of aircraft refrigeration system. Boot strap refrigeration, Regenerative, Reduced ambient, Dry air rated temperature(DART).

UNIT-II

08

Vapour Compression System: Single stage system, Analysis of vapour compression cycle, Use of T-Sand P-H charts, Effect of change in suction and discharge pressures on C.O.P, Effect of sub cooling of condensate& superheating of refrigerant vapour on C.O.P of the cycle, Actual vapour compression refrigeration cycle, Multistage vapour compression system requirement, Removal of flash gas, Intercooling, Different configuration of multistage system, Cascade system.

UNIT-III

08

Vapour Absorption system: Working Principal of vapour absorption refrigeration system ,Comparison between absorption & compression systems, Elementary idea of refrigerant absorbent mixtures, Temperature – concentration diagram & Enthalpy – concentration diagram, Adiabatic mixing of two streams, Ammonia – Water vapour absorption system, Lithium- Bromide water vapour absorption system, Comparison.

Refrigerants: Classification of refrigerants, Nomenclature, Desirable properties of refrigerants, Common refrigerants, Secondary refrigerants and CFC free refrigerants.

UNIT-IV

08

Air Conditioning: Introduction to air conditioning, Psychometric properties and their definitions, Psychometric chart, Different Psychometric processes, Thermal analysis of human body, Effective temperature and comfort chart, Cooling and heating load calculations, Selection of inside & outside design conditions, Heat transfer through walls & roofs, Infiltration & ventilation, Internal heat gain, Sensible heat factor (SHF), By pass factor, Grand Sensible heat factor (GSHF), Apparatus dew point(ADP).

UNIT-V

08

Refrigeration Equipment & Application: Elementary knowledge of refrigeration & air conditioning equipment e.g. compressors, condensers, evaporators & expansion devices, Air washers, Cooling, towers& humidifying efficiency, Food preservation, Cold storage, Refrigerates Freezers, Ice plant, Water coolers, Elementary knowledge of transmission and distribution of air through ducts and fans, Basic difference between comfort and industrial air conditioning.

Text Books

1. ManoharPrasad ,Refrigeration and Air conditioning, New Age International (P) Ltd.Pub.
2. C.P Arora.,Refrigeration and Air conditioning , McGrawHill
- 3.R.K. Rajpoot ,Refrigeration& Air conditioning, S. Chand

Reference Books

1. Arora&Domkundwar,Refrigeration and Air conditioning.,McGrawHill
2. stoecker& Jones, Refrigeration and Air conditioningMcGrawHill.
3. Roy J. Dossat, Refrigeration and Air conditioning CECSA publication.
4. P.L. Baloney, Refrigeration and Air conditioning .Khanna Publication
5. Kuhen, Ramsey &Thelked, Thermal Environment Engg., Pearson publication

ME-702
COMPUTER AIDED DESIGN

L T P
3 1 0

UNIT-I

08

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

08

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, 3 D transformations, multiple transformation.

UNIT-III

08

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

07

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

UNIT-V

09

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 modelling, Stiffness matrix/displacement matrix, Stiffness matrix for spring system, bar & beam elements, bar elements in 2D space (truss element).

Text Books

1. Hearn & Baker, Computer Graphics, Prentice Hall of India
2. Anupam Saxena & B. Sahay, Computer Aided Engineering Design, Anamaya Publishers
3. Groover & EW Zimmers, Jr. Prentice, CAD/CAM, HP Hall India Ltd. 40

Reference Books

1. Ibrahim Zeid & R Sivasubramaniam, CAD/CAM Theory and Practice, McGraw Hill
2. RK Srivastava, Computer Aided Design, Umesh Publications
3. DF Rogers & JA Adams, Mathematical Elements for Computer Graphics, McGraw Hill
4. SS Rao, Finite Element Method, Wesley Publication
5. CS Krishnamoorthy, FE Analysis Theory and Programming, Tata McGraw Hill
6. MK Jain, SRK Iyenger & RK Jain, Numerical Method for Engg Computation, Wiley Eastern Limited

ME-703
COMPUTER AIDED MANUFACTURING

L T P
3 1 0
08

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

08

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

10

System Devices Introduction to DC motors, stepping motors, feedback devices such as encoder, counting devices, digital to analog converter and vice versa. 3 Interpolators Digital differential Integrator-Principle of operation, exponential deceleration; 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

07

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

07

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.

Text Books References:

1. Mikell P. Groover, Automation, Production Systems and Computer Integrated Manufacturing, Pearson
2. Kundra and Rao, Computer Aided Manufacturing, McGrawHILL
3. Koren, Computer control of Manufacturing systems, McGrawHILL

References Books

1. S.J. Martin, NC Machine Tools, London: Hodder & Stoughton
2. Koren, NC Machines, Lotus Press
3. Groover, CAD/CAM, Pearson
4. P.N Rao, CAM, McGrawHILL
5. James L. Navins, Concurrent design of products and processes

ME-7041
NON-DESTRUCTIVE TESTING

L T P
3 1 0

UNIT-I

07

Introduction Scope and advantages of NDT. Comparison of NDT with DT. Some common NDT methods 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

10

Common NDT methods Die penetrate test (liquid penetrate inspection), Principle, scope. Equipment & techniques, Tests stations, Advantages, types of penetrant and developers. Illustrative examples – Heavy castings of large size, frame of jet engine, porosity testing of nickel alloys, leak testing. Zyglo test 6 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

10

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 electromagnetic radiations, source of radioactive materials & technique. Photo electric effect, Rayleigh's scattering (coherent scattering), Compton's scattering (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

07

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. Case Study – Ultrasonography of human body.

UNIT-V

06

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

Text Books :

1. Prasad, Non-Destructive Testing and Evaluation of Materials, McGraw Hill Edu.
2. Baldev Raj, T. Jayakumar, M. Thavasimuthu, Practical Non-destructive Testing, Woodhead Publishing.
3. Ravi Prakash, Non-Destructive Testing Techniques, New Age International.

References books :

1. Robert C. McMaster, Nondestructive Testing Handbook, American Society for Nondestructive.
2. Barry Hull and Vernon John, NDT, Springer
3. Buldev Raj, Practical Non destructive Testing., Narosa Publication
4. Lari Kumar, NDT, S.K. Kataria & Sons

ME-7042
FINITE ELEMENT METHOD

L T P
3 1 0

UNIT-I

10

Introduction to finite difference method and finite elements method, Advantages and limitations, Mathematical formulation of FEM, Different approaches in Finite Element Method - Direct Stiffness approach, simple examples, Variational approach, Elements of variational calculus - Euler Lagrange equation, Rayleigh Ritz method, Weighted Residual methods, Point Collocation method, Galarkin method - Steps involved in FEM.

UNIT-II

08

Types of Elements Used Interpolation Polynomials - Linear elements Shape function - Analysis of simply supported beam - Element and Global matrices - Two-dimensional elements, triangular and rectangular elements - Local and Natural Co-ordinate systems.

UNIT-III

08

Finite Element Formulation of Field Problems 1-D and 2-D heat transfer, fluid flow (incompressible and non viscous fluid) in ducts, Simple electrical and magnetic field problems. Simple Numerical examples.

UNIT-IV

07

Finite Element Formulation of Solid Mechanics Problems 1-D problem of shaft; Truss element analysis of pinned truss, Plane stress/strain problems, Axi-symmetric problems, thin plate problems; Vibration of shafts & beams.

UNIT-V

07

Numerical Methods in FEM Evaluation of shape functions - One dimensional & triangular elements, Quadrilateral elements, Isoperimetric elements - Numerical Integration, Gauss Legendre quadrature - Solution of finite element equations – Gauss Elimination Method, Cholesky decomposition.

Text Books :

1. O.C. Zienkiewicz and R.L., The Finite Element Method, Taylor McGraw Hill
2. J. N. Reddy, An Introduction to Finite Element Method, McGraw Hill
3. K.J. Bathe, Finite Element Procedure in Engineering Analysis, McGraw Hill

References Books:

1. C.S. Krishnamoorthy, Finite Element Analysis, Tata McGraw Hill
2. R.D. Cook, D.S. Malcus and M.E. Plesha John, Concepts and Application of Finite Element Analysis, Wiley
3. T.R Chandragupta and A.D. Belegundu, Introduction to Finite Elements in Engineering, Prentice Hall India
4. E Balagurusamy, Numerical Methods, Tata McGraw Hill

ME-7043
MECHANICAL VIBRATIONS

L T P
3 1 0

UNIT – I

10

Introduction, Classification of Vibration Systems, Harmonic motion, Vector representation of harmonic motion, Natural frequency & response, Effects of vibration, superposition of simple harmonic motions, beats, Fourier analysis-analytical and numerical methods.

Single Degree Freedom System, Equation of motion, Newton's method, D'Alembert's principle, Energy method etc., Free vibration, Natural frequency, Equivalent systems, Displacement, Velocity and acceleration, Response to an initial disturbance, Torsional vibrations, Damped vibrations, Vibrations of systems with viscous damping, Logarithmic decrement, Energy dissipation in viscous damping.

UNIT – II

08

Single Degree Freedom: Forced Vibration Forced vibration, Harmonic excitation with viscous damping, steady state vibrations, Forced vibrations with rotating and reciprocating unbalance, Support excitation, Vibration isolation, Transmissibility, Vibration measuring instruments, Displacement, velocity and acceleration measuring instruments.

UNIT- III

08

Two Degree Freedom systems Introduction, Principal modes, Double pendulum, Torsional system with damping, Coupled system, Principle of vibration absorber, Undamped dynamic vibration absorbers, Torsional vibration absorber, Centrifugal pendulum absorbers, Vibration isolators and Dampers.

UNIT- IV

07

Multi-degree Freedom system: Exact Analysis, Undamped free and forced vibrations of multi-degree freedom systems, influence coefficients, Reciprocal theorem, Torsional vibration of multi-degree rotor system, Vibration of gear system, Principal coordinates, Continuous systems- Longitudinal vibrations of bars, Torsional vibrations of circular shafts.

UNIT- V

07

Multi Degree Freedom system: Numerical Analysis by Rayleigh's method, Dunkerely's, Holzer's and Stodola methods, Rayleigh-Ritz method.

Critical speed of shafts, Whirling of uniform shaft, Shaft with one disc with and without damping, Multi-disc shafts, Secondary critical speed.

Text Books:

1. G. K. Groover, Jain Brothers, Mechanical Vibrations, Roorkee.
2. S Bhave, Mechanical Vibrations-Theory & Practice, Pearson Education.
3. Singhal, Mechanical Vibrations-Theory & Applications, Katson Books.

References Books:

1. Thomson&Dahleh, Theory of Vibrations with Applications, Pearson Education.
2. L Meirovitch, Elements of Vibration Analysis, McGraw-Hill Education.
3. Tse, Mechanical Vibrations , Morse & Hinkle
4. V. Rama Murthy, Mechanical Vibrations, Narosa Publications
5. D. Nag, Mechanical Vibrations, Wiley

ME-7044
MECHANICAL SYSTEM DESIGN

L T P
3 1 0

UNIT-I

09

Engineering process and System Approach Basic concepts of systems, Attributes characterizing a system, system types, Application of system concepts in Engineering, Advantages of system approach, Problems concerning systems, Concurrent engineering, A case study-Viscous lubrication system in wire drawing.

Problem Formulation Nature of engineering problems, Need statement, hierarchical nature of systems, hierarchical nature of problem environment, problem scope and constraint, A case study: heating duct insulation system, high speed belt drive system.

UNIT-II

08

System Theories System Analysis, Black box approach, state theory approach, component integration approach, Decision process approach, A case study- automobile instrumentation panel system. System modelling Need of modelling, Model types and purpose, linear systems, mathematical modelling, concepts, A case study compound bar system.

UNIT-III

08

Graph Modelling and Analysis Graph Modelling and analysis process, path problem, Network flow problem, A case study: Material handling system.

Optimization Concepts Optimization processes, Selection of goals and objectives-criteria, methods of optimization, analytical, combinational, subjective. A case study: aluminium extrusion system.

UNIT-IV

08

System Evaluation Feasibility assessment, planning horizon, time value of money, Financial analysis, A case study: Manufacture of maize starch system. Calculus Method for Optimization Model with one decision variable, model with two decision variables, model with equality constraints, model with inequality constraints, A case study: Optimization of an insulation system.

UNIT-V

09

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: Installation of machinery. System Simulation Simulation concepts, simulation models, computer application in simulation, spread sheet simulation, Simulation process, problem definition, input model construction and solution, limitation of simulation approach, A case study: Inventory control in production plant.

Text Books :

1. DD Reredith, KV Wong, RW Woodhead, and RR Worthman, Design and Planning of Engineering systems, Prentice Hall Inc., Eaglewood Cliffs, New Jerse
2. K U Siddiqui, Manoj Kumar singh, Mechanical System Design , New age publication
3. JR Dixon, Design Engineering, TMH, New Delhi

References Books:

1. Robert Matousck, Engineering Design, Blackie and son ltd. Glasgow
2. Devid I Cleland, William R King, System Analysis and Project Management, McGraw Hill.
3. V Gupta and PN Murthy, An Introduction to Engineering Design Method, TMH, New Delhi

ME-7045
REVERSE ENGINEERING AND RAPID PROTOTYPING

L T P
3 1 0
07

UNIT-I

CAD Designing: Introduction, Model preparation, Slicing, Support structures and machine instructions. CAD-CAM and its integration, Development of CAD CAM., The importance of being Rapid, The nature of RP/T, The state of RP/T industry. Rapid Prototyping Defined. Time compression Technologies, Product development and its relationship with rapid prototyping.

UNIT-II

10

STL Files & RP Software's: Process overviews, STL interface Specification, STL data generation, STL data Manipulation, Advantages and limitations of STL file format. STL file Generation, File Verification & Repair, Build File Creation, and Part Construction, Part Cleaning and finishing, Process Strength & limitations. Open files. Repair of STL files. Alternative RP interfaces. STL file generation, Defects in STL files and repairing algorithms. Tool Path, Part Orientation, Support Generation, Editing and Slicing. RP Software's: Magic or Mimic's, Axure RP Pro, Solid View/Pro RP.

UNIT-III

08

Rapid Tooling : Introduction, Comparison between Conventional Tooling and Rapid Tooling, Soft Tooling Bridge Tooling, Rapid Injection Molding, Metal Filled Epoxy Tooling, Powdered Metal Tooling, One Piece Mould Approach, Two Piece Mould Approach, Advantages, limitations Applications.

UNIT-IV

07

Reverse Engineering, Integration of RP and RE: History of Reverse Engineering, Scope and tasks of RE, Preserving and preparation for the four-stage process, Evaluation and Verification-Technical Data Generation, Data Verification, Project Implementation, Equipment Involved in the Reverse Engineering technique.

UNIT-V

08

Domain analysis- process of duplicating Applications and case studies. Cognitive approach to program understated, integrating formal and structured methods in reverse engineering, Integrating reverse engineering, reuse and specification tool environments to Rapid Prototyping, Interdisciplinary Application of RP and RE.

Text Books:

1. T J Bigger staff, Design Recovery for Maintenance and Reuse, IEEE Corpn. July 1991
2. S. Rugaban, White paper on RE, Technical Report, Georgia Instt. of Technology, 1994
3. Katheryn, Reverse Engineering, A. Ingle, McGraw-Hill, 1994

References books:

1. Aiken, Peter, Data Reverse Engineering, McGraw-Hill, 1996
2. Linda Wills, Reverse Engineering, Kluiver Academic Publishers, 1996
3. Bjorke, Layer Manufacturing, Tapir Publisher. 1992.
4. EldadEilam, Reversing Secret of Reverse engineering, John Wiley & Sons.

ENGINEERING ECONOMICS

L	T	P
3	0	0

UNIT-I **08**

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of economics, relation between science, engineering, technology and economics; Meaning of demand, determinants of demand, shifts in demand, law of demand, price elasticity of demand & types, income elasticity, cross price elasticity, determinants of elasticity and uses and importance of elasticity.

UNIT-II **08**

Concept of Supply: Law of supply, factors affecting supply, and elasticity of supply. Demand forecasting: introduction, meaning and forecasting, methods or techniques of demand forecasting, criteria for good demand forecasting and demand forecasting for a new product.

UNIT-III **08**

Cost Analysis: Introduction, types of costs, cost-output relationship: cost function, cost-output relationships in the short run, and cost-output relationships in the long run; Short run and long run, break- even analysis; Production functions: laws of variable proportions, law of returns and economies of scale: internal and external.

UNIT-IV **08**

Market Structure: Market structure perfect competition, imperfect competition – monopolistic, oligopoly and duopoly salient features of price determination and various market conditions.

UNIT-V **08**

Nature and characteristics of Indian economy: Concepts of LPG, elementary concepts of national income, inflation and business cycles ,concept of N.I and measurement, meaning of inflation, types and causes and phases of business cycle investment decisions for boosting economy(national income and per capital income).

Text Books:

1. Premvir Kapoor, "Sociology and Economics for Engineers", Khanna Publishing.
2. Salvatore D, "Principles of Microeconomics", Oxford University Press.
3. Koutsoyiannis A, "Modern Microeconomic", Macmillan Education Ltd.

Reference Books:

1. Dwivedi DN, "Principles of Microeconomics", Pearson Education.
2. Cowell, FA, "Microeconomic Principles and Analysis", Oxford University Press.
3. Riggs J L, "Engineering Economics", McGraw Hills.

AS-702
INDUSTRIAL MANAGEMENT

L T P
3 0 0

UNIT-I **08**

Introduction: Concept and scope of industrial management. **Productivity:** definition, measurement, productivity index, types of production system and industrial ownership.

UNIT-II **08**

Functions of Management: Taylor's scientific management theory, Fayol's principles of management, social responsibilities of management, introduction to human resources management: nature of HRM, functions and importance of HRM.

UNIT-III **08**

Work Study: Introduction, definition, objectives, steps in work study; **Method study:** Definition, objectives, steps of method study; **Work measurement:** Purpose, types of study: Stop watch methods steps: Allowances, standard time calculations, work sampling, production planning and control inventory control: inventory, cost, models of inventory control: EOQ, ABC, VED.

UNIT-IV **08**

Quality Control: Statistical quality control, control charts for variables and attributes, acceptance sampling: single sampling- double sampling plans and introduction to TQM.

UNIT-V **08**

Project Management: Project network analysis, CPM, PERT and project crashing and resource leveling.

Text Books:

1. Gideon Halevi, "Industrial Management- Control and Profit: A Technical Approach" Springer.
2. A.P. Verma and N. Mohan "A Textbook of Industrial Management" S.K. Kataria & Sons.
3. S. K. Sharma, Savita Sharma "Industrial Engineering and Organization Management", Kataria and Sons.

Reference Books:

1. S.C. Sharma & T.R. Banga, "Engineering Management" (Industrial Engineering & Management), Khanna Book Publishing Co.
2. P. Khanna, "Industrial Engineering and Management", Dhanpatrai publications Ltd.
3. Paneer Selvam, "Production & Operation Management", PHI.

ME 751
REFRIGERATION & AIR CONDITIONING LAB

L T P
0 0 2

Minimum eight experiments out of the following:

1. Experiment on refrigeration test rig and calculation of various performance parameters.
2. Study of different types of expansion devices used in refrigeration system.
3. Study of different types of evaporators used in refrigeration systems.
4. To study basic components of air-conditioning system.
5. Experiment on air-conditioning test rig & calculation of various performance parameters.
6. Experiment on Vapor Absorption Refrigeration Test Rig and calculation of various performance.
7. Experiment on Ice-plant.
8. Study of Hermetically sealed compressor.
9. Experiment on air washers
10. Visit of a central air conditioning plant and its detailed study.
11. Visit of cold-storage and its detailed study.
12. Experiment on two stage Reciprocating compressor for determination of volumetric efficiency, PV diagram and effect of intercooling.

ME-752
CAD/CAM LAB

L T P
0 0 2

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

CAD Experiments

1. Understanding and use of any 2-D Modelling Software commands.
2. Line Drawing or Circle Drawing experiment: Writing and validation of computer program.
3. Geometric Transformation algorithm experiment for translation/rotation/scaling: Writing and validation of computer program.
4. Design of machine component or other system experiment: Writing and validation of computer program.
5. Understanding and use of any 3-D Modelling Software commands.
6. Solid modelling of a machine component
7. Writing a small program for FEM for 2 spring system and validation of program or using a fem Package.

CAM Experiments

1. Experiment on difference between ordinary and NC machine, study or retrofitting.
2. To study the characteristic features of CNC machine.
3. Part Programming (in word address format) experiment for turning operation (including operations such as grooving and threading) and running on CNC machine.
4. Part Programming (in word address format) experiment for parting operation (including operations such as grooving and threading) and running on CNC machine.
5. Part Programming (in word address format or ATP) experiment for drilling operation (point to point) and running on CNC machine.
6. Part Programming (in word address format or ATP) experiment for milling operation (contouring) and running on CNC machine.
7. Experiment on study of system devices such as motors and feedback devices.

ME-8011
ADVANCED WELDING

L T P
3 1 0
09

UNIT-I

Introduction: Welding as compared with other fabrication processes, Importance and application of welding, classification of welding processes, Health & safety measures in welding. Welding Power Sources: Physics of welding Arc, Basic characteristics of power sources for various arc welding processes, Transformer, rectifier and generators.

Physics of Welding Arc: Welding arc, arc initiation, voltage distribution along the arc, arc characteristics, arc efficiency, heat generation at cathode and anode, Effect of shielding gas on arc, isotherms of arcs and arc blow.

Metal Transfer: Mechanism and types of metal transfer in various arc welding processes.

UNIT-II

09

Welding Processes: Manual Metal Arc Welding (MMAW), TIG, MIG, Plasma Arc, Submerged Arc Welding, Electro gas and Electroslag, Flux Cored Arc Welding, Resistance welding, Friction welding, Brazing, Soldering and Braze welding processes, Laser beam welding, Electron beam welding, Ultrasonic welding, Explosive welding, Friction Stir Welding, Underwater welding & Microwave welding.

UNIT-III

07

Heat Flow Welding: Calculation of peak temperature; Width of Heat Affected Zone (HAZ); cooling rate and solidification rates; weld thermal cycles; residual stresses and their measurement; weld distortion and its prevention.

UNIT-IV

07

Repair & Maintenance Welding: Hardfacing, Cladding, Surfacing, Metalizing processes and Reclamation welding.

Weldability: Effects of alloying elements on weld ability, welding of plain carbon steel, CastIron and Aluminium. Micro & Macro structures in welding.

UNIT-V

08

Weld Design: Types of welds & joints, Joint Design, Welding Symbols, weld defects, Inspection/testing of welds, Introduction to Welding Procedure Specification & Procedure Qualification Record.

Text Books:

1. Welding and Welding Technology, by- Richard L. Little, McGraw Hill Education.
2. Welding Principles and Practices, by- Edwards R. Bohnart, McGraw Hill Education.
3. Welding technology , O.P khanna , DhanpatRai

References Books;

1. R. S. Parmar, Welding Engineering and Technology, KhannaPublishsers.
2. N K Srinivasan , Welding Technology, KHANNA PUBLISHERS
3. R S Parmar, Welding Engineering and Technology. KHANNA PUBLISHER
4. William. A. Bowditch, Welding Technology Fundamentals, Goodheart-Willcox
5. Baldev Raj, Welding Technology for engineers, ASM International

ME-8012
ENERGY CONSERVATION AND MANAGEMENT

L T P
3 0 0

UNIT –I

08

Introduction to energy & power scenario of world, National Energy consumption data, environmental aspects associated with energy utilization; Energy Auditing- need, types, methodology and barriers, role of energy managers, instruments of energy auditing.

UNIT –II

08

Components of EB billing, HT and LT supply, transformers, cable sizing; Concept of capacitors, power factor improvement, harmonics; Electric motors- motor efficiency computation, energy efficient motors; Illumination- Lux, Lumens, types of lighting, efficacy, LED lighting and scope of energy conservation in lighting.

UNIT –III

08

Thermal systems, Boilers, Furnaces and Thermic Fluid heaters- efficiency computation and energy conservation measures; Steam distribution and usage, steam traps, condensate recovery, flash steam utilization; Insulation & Refractories.

UNIT –IV

08

Energy conservation in major utilities; pumps, fans, blowers, compressed air systems, Refrigeration & Air Conditioning systems, Cooling Towers, DG sets.

UNIT-V

08

Energy Economics- discount period, payback period, internal rate of return, net present value; Life Cycle costing- ESCO concept.

Text Books:

1. Witte L.C., Schmidt P.S. and Brown D.R., Industrial Energy Management and Utilization, Hemisphere Publ., Washington, 1988.
2. Callaghn P.W., Design and Management for Energy Conservation, Pergamon Press, Oxford, 1981.
3. Murphy W.R. and McKay G., Energy Management, Butterworths, London, 1987.

Reference Books:

1. K V Sharma and P Venkateshaiah, Energy Management and Conservation.
2. Frank Kreith and D Yogi Goswami, Energy Management and Conservation Handbook (Mechanical and Aerospace Engineering Series)
3. Giovanni Petrecca, Energy Conversion and Management.
4. Dr. Subhash L.Gadhve, Energy ConsevAation and management, Technical Publication
5. KV Sharma, EnergyConsevAation and management.

ME-8013
TOTAL QUALITY MANAGEMENT

L T P
3 1 0
08

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

09

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

08

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

08

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

07

ISO-9000 and its concept of Quality Management: ISO 9000 series, Taguchi method, JIT in some details.

Text Books:

1. Proff. V.Vijayan, Total Quality Management, S.Chand Publication
2. Greg Bounds. "Beyond Total Quality Management". McGraw Hill, 1994.
3. Menon, H.G, "TQM in New Product manufacturing", McGraw Hill 1992

References Books:

1. Poornima M. Charantimath, Total Quality Management, Pearson Education
2. Besterfield Dale H, Total Quality Management, Pearson Education India
3. Lt. Gen. H.LaI, "Total Quality management", Wiley Eastern Limited, 1990
4. Total Quality Management By ByMukheerji, PHI Publication

THEORY OF ELASTICITY

L	T	P
3	1	0

UNIT I**08**

Basic Equations of Elasticity: Definition of Stress and Strain: Stress – Strain Relationships – Equations of Equilibrium, Compatibility Equations, Boundary Conditions, Saint Venant's principle – Principal Stresses, Stress Ellipsoid – Stress Invariants.

UNIT II**08**

Plane Stress and Plane Strain Problems: Airy's Stress Function, Bi-Harmonic Equations, Polynomial Solutions, Simple Two-Dimensional Problems in Cartesian Coordinates Like Bending of Cantilever and Simply Supported Beams.

UNIT III**08**

Polar Coordinates: Equations of Equilibrium, Strain – Displacement Relations, Stress – Strain Relations, Airy's Stress Function, Axis – Symmetric Problems, Introduction to Dunder's Table, Curved Beam Analysis, Lamé's, Kirsch, Michell's And Boussinesque Problems – Rotating Discs.

UNIT IV**08**

Torsion: Navier's Theory, St. Venant's Theory, Prandtl's Theory on Torsion, Semi- Inverse Method and Applications to Shafts of Circular, Elliptical, Equilateral Triangular and Rectangular Sections. Membrane Analogy.

UNIT V**08**

Introduction to Theory of Plates and Shells: Classical Plate Theory – Assumptions – Governing Equations – Boundary conditions – Navier's Method of Solution for Simply Supported Rectangular Plates Levy's Method of Solution for Rectangular Plates Under Different Boundary Conditions.

Text Books:

1. Wang, C. T., Applied Elasticity, McGraw – Hill Co., New York, 1993.
2. Sokolnikoff, I. S., Mathematical Theory of Elasticity, McGraw – Hill, New York, 1978.
3. Volterra & J.H. Caines, Advanced Strength of Materials, Prentice Hall, New Jersey, 1991.

Reference Books:

1. Barber, J. R., Elasticity, Kluwer Academic Publishers, 2004.
2. S.Timoshenko, Theory of elasticity.
3. H Jane Helena, Theory of elasticity.
4. Ukadgaonkar Vijay G, Theory of elasticity and Fracture Mechanism.

ADVANCED PRODUCTION ENGINEERING

L T P
3 1 0
08

UNIT-I

Metal Cutting Theory: Geometry of cutting tools, metal machining, chip formation, types of chips, force analysis, velocity relationship, stress and strain analysis, power and energy relationships, thermal aspects, dynamometers for turning and drilling. Evaluation of machinability, tool wear and tool life, cutting forces, surface finish, economies of metal machining and cutting fluids.

UNIT-II

09

Machine Tools System: Design analysis of machine tools, elements, structure, slideways and guides, spindle unit drives in machine tools, layout of gear box, stepped regulators, stepless regulators, and hydraulic regulators. Tool Design of CNC machines Tooling principles and tool layouts for turrets, automates, operation planning considerations, designing of cams. Tooling for CNC machines, Design of single point cutting tools, rigidity, design of chip breakers, dynamic chip breaking, design of press dies, component of die, cutting action in a die, clearance, cutting forces, shear, centre of pressure,

UNIT-III

06

Jigs and fixture: Usefulness of jigs and fixtures, principles of design, locating and clamping, diamond pin locator, jig bushes, drill jigs, milling, turning, boring and broaching fixtures, assembly fixtures, welding fixtures, indexing devices, materials for jigs and fixtures, economics of jigs and fixtures.

UNIT-IV

09

Unconventional Machining Processes: Mechanical Processes: Ultrasonic Machining, Elements of USM, Acoustic Head and Design etc., Abrasive Jet Machining, Variables effecting AJM, Water Jet Machining, Equipment and process details, Electrochemical Processes: elements of process, electrolytes & their properties, chemistry of process, metal removal rate. Thermal aspect, temperature rise & pressure-flow rate, tool design, accuracy & surface finish, advantages, application & limitations of the process.

UNIT-V

08

Thermal processes: Electrical discharge machining, mechanism of metal removal, accuracy and surface finish, application & future trends, Plasma Arc Machining, mechanism of metal removal, accuracy and surface finish, economics and application of plasma jets, Electro/Laser Beam Machining: Electro beam machining: generation and control of electron beam, process capability and limitations. Laser beam machining: Principles of working, thermal aspect, material removal, cutting speed and accuracy, advantages & limitations.

Text Books:

1. R.K. Jain, Production Technology, Khanna Publishers
2. Ghosh Amitabh, Manufacturing Processes, PEARSON India
3. Dr. P.C Sharma, Production Engineering., S Chand

References Books.

1. Bhattacharya, Metal Cutting Principles, New Central Book Agency
2. PN Rao, Manufacturing technology, McGrawHill
3. Martend T Telsang, Industrial Engineering and production Management, S Chand

ME-802
AUTOMOBILE ENGINEERING

L T P
3 1 0
06

UNIT-I

Introduction: Basic concepts of Automobile Engineering and general configuration of an automobile, Power and Torque characteristics. Rolling, air and gradient resistance. Tractive effort. Gear Box. Gear ratio determination.

UNIT-II

08

Transmission System: Requirements. Clutches. Torque 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. Hotchkiss drive and Torque tube drive.

UNIT-III

10

Braking System: General requirements, Road, tyre adhesion, weight transfer, Braking ratio. Mechanical brakes, Hydraulic brakes. Vacuum and air brakes. Thermal aspects. Antilock braking system (ABS), electronic brake force distribution (EBD) and traction control.

Chassis and Suspension System: Loads on the frame, Strength and stiffness, Independent front & rear suspension, Perpendicular arm type, Parallel arm type, Dead axle suspension system, Live axle suspension system, Air suspension & shock absorbers.

UNIT-IV

07

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, Carburettor etc.

UNIT-V

09

Emission standards and pollution control: Indian standards for automotive vehicles-Bharat I and II, Euro-I and Euro-II norms, fuel quality standards, environmental management systems for automotive vehicles, engine emission control by 3-way catalytic converter system, fuel additives and modern trends in automotive engine efficiency and emission control.

Alternative Energy Sources: Alternative energy sources, natural gas, LPG, biodiesel, bio-ethanol, gasohol and hydrogen fuel in automobiles, modifications needed, performance, combustion & emission characteristics of alternative fuels in SI and CI engines, Electric and Hybrid vehicles, application of Fuel Cells. Prevention maintenance and overhauling.

Text Books:

1. Hietner, Automotive Engineering, CBS
2. Narang, Automobile Engineering, KHANNA PUBLISHERS
3. TTTI, Automobile Engineering, Pearson India, McGraw Hill Education

References Books:

1. Newton and Steeds, Automobile Engineering, Society of Automotive Engineers
2. Ramakrishna, Automobile Engineering, PHI, India.
3. Kripal Singh, Automobile Engineering., Standard
4. Kirpal Singh, Automobile Engineering, 7th ed., Standard Publishers, New Delhi, 199

UNIT-I**08**

Introduction of Engineering Economics and Demand Analysis: Meaning and nature of economics, relation between science, engineering, technology and economics; Meaning of demand, determinants of demand, shifts in demand, law of demand, price elasticity of demand & types, income elasticity, cross price elasticity, determinants of elasticity and uses and importance of elasticity.

UNIT-II**08**

Concept of Supply: Law of supply, factors affecting supply, and elasticity of supply. Demand forecasting: introduction, meaning and forecasting, methods or techniques of demand forecasting, criteria for good demand forecasting and demand forecasting for a new product.

UNIT-III**08**

Cost Analysis: Introduction, types of costs, cost-output relationship: cost function, cost-output relationships in the short run, and cost-output relationships in the long run; Short run and long run, break- even analysis; Production functions: laws of variable proportions, law of returns and economies of scale: internal and external.

UNIT-IV**08**

Market Structure: Market structure perfect competition, imperfect competition – monopolistic, oligopoly and duopoly salient features of price determination and various market conditions.

UNIT-V**08**

Nature and characteristics of Indian economy: Concepts of LPG, elementary concepts of national income, inflation and business cycles ,concept of N.I and measurement, meaning of inflation, types and causes and phases of business cycle investment decisions for boosting economy(national income and per capital income).

Text Books:

1. Premvir Kapoor, "Sociology and Economics for Engineers", Khanna Publishing.
2. Salvatore D, "Principles of Microeconomics", Oxford University Press.
3. Koutsoyiannis A, "Modern Microeconomic", Macmillan Education Ltd.

Reference Books:

1. Dwivedi DN, "Principles of Microeconomics", Pearson Education.
2. Cowell, FA, "Microeconomic Principles and Analysis", Oxford University Press.
3. Riggs J L, "Engineering Economics", McGraw Hills.

AS-802
INDUSTRIAL MANAGEMENT

L T P
3 0 0

UNIT-I **08**

Introduction: Concept and scope of industrial management. **Productivity:** definition, measurement, productivity index, types of production system and industrial ownership.

UNIT-II **08**

Functions of Management: Taylor's scientific management theory, Fayol's principles of management, social responsibilities of management, introduction to human resources management: nature of HRM, functions and importance of HRM.

UNIT-III **08**

Work Study: Introduction, definition, objectives, steps in work study; **Method study:** Definition, objectives, steps of method study; **Work measurement:** Purpose, types of study: Stop watch methods steps: Allowances, standard time calculations, work sampling, production planning and control inventory control: inventory, cost, models of inventory control: EOQ, ABC, VED.

UNIT-IV **08**

Quality Control: Statistical quality control, control charts for variables and attributes, acceptance sampling: single sampling- double sampling plans and introduction to TQM.

UNIT-V **08**

Project Management: Project network analysis, CPM, PERT and project crashing and resource leveling.

Text Books:

- 1 Gideon Halevi, "Industrial Management- Control and Profit: A Technical Approach" Springer.
- 2 A.P. Verma and N. Mohan "A Textbook of Industrial Management" S.K. Kataria & Sons.
- 3 S. K. Sharma, Savita Sharma "Industrial Engineering and Organization Management", Kataria and Sons.

Reference Books:

- 1 S.C. Sharma & T.R. Banga, "Engineering Management" (Industrial Engineering & Management), Khanna Book Publishing Co.
- 2 P. Khanna, "Industrial Engineering and Management", Dhanpatrai publications Ltd.
- 3 Paneer Selvam, "Production & Operation Management", PHI.

ME-851
AUTOMOBILE ENGINEERING LAB

L T P
0 0 2

Experiments: Say at least 8 experiments out of following in depth and details.

1. Study & experiment on Valve mechanism.
2. Study & experiment on Gear Box.
3. Study & experiment on Differential Gear Mechanism of Rear Axle.
4. Study & experiment on Steering Mechanism.
5. Study & experiment on Automobile Braking System.
6. Study & experiment on Chassis and Suspension System.
7. Study & experiment on Ignition system of I.C. Engine.
8. Study & experiment on Fuel Supply System of S.I. Engines- Carburetor, Fuel Injection Pump and MPFI.
9. Study & experiment on Fuel Supply System of C.I. Engines- Injector & Fuel Pump.
10. Study & experiment on Air Conditioning System of an Automobile.
11. Visit of an Automobile factory.