SCHEME OF EXAMINATION
B.TECH. 4th Year Mechanical Engineering (Auto) -7th Semester

S. No	Code	Subject Name	Teaching Schedule (Hrs)				Examination Schedule (Marks)			Total Marks	Duration of Exam
			L	T	P/D	Total	Sessional	Theory	Practical/ Viva-Voce		
1	----------	Departmental Elective-I	4	1	-	5	50	100	-	150	3
2	ME 419 E	Advanced Manufacturing Technology	4	1	-	5	50	100	-	150	3
3	MEA 401E	Numerical /Methods and Optimization Technique	4	1	-	5	50	100	-	150	3
4	MEA 403E	Automation in manufacturing	3	1	-	4	50	100	-	150	3
5	MEA 405 E	Basics of Mechatronics Engineering	4	1		5	50	100		150	3
6	ME 409E	Project-1	-	-	7	7	100	-	100	200	3
7	MEA 411E	Numerical /Methods and Optimization Technique Lab		-	2	2	25	-	25	50	3
8	ME 411 E	Seminar	2			2	-	-	-	-	-
9	ME 413E	In Plant Training Report	-	-	-	-	125	-	-	125	-
	TOTAL		21	5	9	35	500	500	125	1125	

Note: Students will be allowed to use Non-Programmable scientific calculator. However, sharing of calculator will not be permitted. Under ME-411E Some of the students may be evaluated in 7th semester and remaining in 8th Sem. Marks will be added in 8th Sem.

*** Refer List of Elective I**

DEPARTMENT ELECTIVE-I

ME 421E	**Finite Element Method**
ME 423E	Applied Numerical Techniques and Computer Programming
ME 427E	Machine Tool Design
ME 435 E	Renewable Energy Resources
ME 437E	**Maintenance Engineering**

B.Tech. (Seventh Semester) Mechanical Engineering (Auto)
Advanced Manufacturing Technology
ME 419 E

L	T	P/D	Total
4	I	-	5

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exams. : 03 Hrs

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Hot machining, Machining of Plastics, Unit heads, Plastics cooling, electro forming, Surface Cleaning and Surface Treatments, Surface Coatings, Paint Coating and Slushing, Adhesive Bonds, Adhesive Bond Joints, Adhesives, Surface Coating for Tooling, Graphite Mould Coating, Vacuum Mould Process. Introduction, Types of Composites materials, Agglomerated Materials, Reinforced materials, Laminates, Surface Coated Materials, Production of Composite Structures, Fabrication of particulate composite Structures, Fabrication of reinforced Composite, Fabrication of Laminates, Machining, Cutting and Joining of Composites.

UNIT II

Introduction, Polymers, Polymerization, Addition of Polymers, Plastics, Types of plastics, Properties of Plastics, Processing of Thermoplastic Plastics, Injection Moulding, Extrusion Process, Sheet forming processes, Processing of Thermosetting Plastics,Compression Moulding, Transfer Moulding, Casting of Plastics, Machining of plastics, other processing methods of plastics Introduction, casting, thread chasing, Thread Rolling, Die Threading and Tapping, Thread Milling, Thread Measurement and Inspection

UNIT III

Theoretical basis of metal forming, classification of metal forming processes, cold forming, hot working, Warm working, Effect of variables on metal forming processes, Methods of analysis of manufacturing processes, Open Die forging, Rolling Power Rolling, Drawing, Extrusion.

UNIT IV

Introduction, Product Application, Limitation of Die Casting, Die Casting Machines,Molten metal Injection systems, I lot chamber machines, Cold chamber machines, Die casting Design, Design of Die casting Dies, Types of Die casting Dies, Die design, Die material, Die Manufacture, Die Lubrication and Coating, Preheating of Dies, Vacuum Die Casting, Recent trends In Die Casting Process.Definition, Cost accounting or costing, Elements of costing, cost structures, Estimation of cost elements, Methods of estimating, Data requirements of cost estimating, Steps in making cost estimate, Chief factors in cost estimating, Numerical examples, calculation of machining times, Estimation of total unit time.

Reference and Text Books:

1. Principles of Manufacturing - By J.S.Campbell, Tata McGraw-Hill
2. Production Engineering Sciences - By Pandey and Sinh Standard Pub.
3. A text book of Production Technology - By P.C. Sharma S.Chand & Company.
4. Manufacturing Materials and Processes - By Lindberg Prentice Hall
5. A text book of Production Engineering - By P.C. Sharma S.Chand & Company.

B. Tech. (Seventh Semester) Mechanical Engineering (Auto)
Numerical / Methods and Optimization Technique

MEA 401 E

L	T	P/D	Total
4	1	-	5

Sessional: 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exam: 03 Hrs

NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

Unit-I

Interpolation and Curve Fitting : Errors in numerical computation, Interpolation problems, Lagrange's interpolation Divided Differences And Newton's Divided Difference Interpolation, Finite Differences, Newton Forward and Backward Interpolation, Least Square Approximations of Degree One and Two , Linearization of Approximations by the Curves Of The Type ax^b , ab^x and ae^{bx}

Unit -II

Non Linear Equations Intermediate value theorem. Bisection method, fixed point method and its convergence, false position method, secant method, Newton Raphson method and its convergence, modified Newton Raphson method (multiple roots)
Simultaneous linear equations: Direct methods: Guass elimination method (matrix approach), gauss Jordon method iterative methods: gauss Jacobi's method, Guass Sedial method and their convergence. Eigen values by power and inverse power method

Unit-III

Numerical Differentiation and Integration : Numerical differentiation formulae (i) differences tables (ii) operator method (iii) undetermined parameter method. Order of numerical differentiation rules and their errors. General numerical quadrature formula, Newton cote's formulae (closed and open type)

Unit-IV

Numerical Solution of Ordinary Differential Equations : Taylor series method , Euler and modified Euler method, Range kutta method of order two, classical method , Simplex Method and Dual Simplex Method Linear programming: Formulation of linear programming problems, solving linear programming problem using Graphical method. Simplex method and Dual simplex method

Text books:

1. Fundamentals of numerical techniques and computations (using C):R. S Goel and Poonam Sethi, Manav Rachna Publishing House Pvt Ltd.
2. Numerical methods in Engineering & Science: B.S. Grewal, Khana Publishers.
3. Numerical Methods for scientific and Engineering Computation : M.K Jain , R.K Jain, S.R.K. Iyengar, New Age International Publishing House.

Reference Books:

1. Numerical Analysis: B.S Goel and S.K Mittal, Pragati Prakashan

2. Linear Programming: C.P. Sethi and S.K. Mittal, Pragati Prakashan

B. Tech. (Seventh Semester) Mechanical Engineering (Auto)

Automation in manufacturing

MEA 403 E

L	T	P	Total
3	1	-	4

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exams. : 03 Hrs

.NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT-I

Introduction:
Automation in Production System, Principles and Strategies of Automation, Basic Elements of an Automated System, Advanced Automation Functions, Levels of Automations, introduction to automation productivity.

Material handling systems:
Overview of Material Handling Systems- Rotary feeders, oscillating force feeder, vibratory feeder, elevator type and Centrifugal type feeders, Principles and Design Consideration, Material Transport Systems, Storage Systems.

UNIT-II

Automated Manufacturing Systems:
Components, Classification and Overview of Manufacturing Systems, Manufacturing Cells, GT and Cellular Manufacturing, FMS, FMS and its Planning and Implementation, Flow lines & Transfer Mechanisms, Fundamentals and Analysis of Transfer Lines, product design for automatic assembly.

Control Technologies in Automation:
Industrial Control Systems, Process Industries Verses Discrete-Manufacturing Industries, Continuous Verses Discrete Control, Computer Process and its Forms. Sensors, Actuators and other Control System Components.

UNIT-III

Evaluation of automatic production:
product manufacturability, orientation devices- active and passive devices, parts orientation and Rocapement.

Pneumatic and hydraulic components and circuits:
Boolean algebra, pneumatic sensors and amplifiers, jet destruction devices, logic devices, schimit triggering devices, developing pneumatic circuits for automatic die casting machine.

UNIT-IV

Modeling and Simulation for manufacturing Plant Automation:
Introduction, need for system modeling, Building Mathematical Model of a manufacturing Plant, Modern Tools- Artificial neural networks in manufacturing automation, AI in manufacturing, Fuzzy decision and control, robots and application of robots for automation.

Reference Books:

1. Handbook of design, manufacturing & Automation : R.C. Dorf, John Wiley and Sons.
2. Automation, Production Systems and Computer Integrated Manufacturing, M.P. Groover,
Pearson Education.
3. Industrial Automation : W.P. David, John Wiley and Sons.
4. Computer Based Industrial Control, Krishna Kant, EEE-PHI
5. An Introduction to Automated Process Planning Systems, Tiess Chiu Chang & Richard A. Wysk
6. Manufacturing assembly Handbook:- BrunoLotter
7. Anatomy of Automation, Amber G.H & P. S. Amber, Prentice Hall.
8. Performance Modeling of Automated Manufacturing Systems, Viswanandham, PHI

.B. Tech. (Seventh Semester) Mechanical Engineering (Auto)

Basics of Mechatronics Engineering
MEA 405E

L	T	P	Total
4	1	-	5

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exams. : 03 Hrs

.NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Introduction to mechatronics, a measurement system with its constituent elements, open and closed loop systems, sequential controllers, and micro processor based controllers.

Basics of electrical technology such as resistors, inductors, capacitors, Impedance, semiconductor devices, diodes and transistors.

UNIT II

Pneumatic and hydraulic systems, directional control valves, valve symbols, pressure control valves, cylinder sequencing, process control valves, rotary actuators, mechanical systems - types of motion, kinematic chains, cams, gear trains, Ratchet & Pawl, belt and chain drives, bearings, mechanical aspects of motor selection, electrical systems, mechanical and solid state switches, solenoids, D.C. & A.C motors, stepper motors, problems.

UNIT III

Continuous and discrete process- lag, steady state error, control modes, two step mode, proportional mode-electronic proportional controllers, derivative control- proportional plus derivative control, integral control-proportional plus integral control, PID controller operational amplifier PID circuits, digital controllers -implementing control modes, control system performance, controller tuning, process, reaction method and ultimate cycle method, velocity control, adaptive control, problems.

UNIT IV

Signal Conditioning: Basic definition, multi domain representation, representation and analysis of periodic / non periodic analog signals, Signal conditioning process, various types of amplifiers, Op-amp, inverting, Non-inverting, Summing amplifiers, comparators, amplifier errors, temperature compensations, A/D conversion, D/A conversion.

Recommended Books:

1. Mechatronics by W. Bolton, published by Addition Wesley.
2. Mechatronics, by **Bolton**, Pearson Education.
3. Introduction to mechatronics by **Alciatore and Michael B. Histant**, TMH.
4. Mechatronics systems design by **Devdas**, Thomson Learning.

B. Tech. (Seventh Semester) Mechanical Engineering (Auto)
Project I
ME 409 E

P/D	Total
7	7

Sessional : 100 Marks
Practical : 100 Marks
Total : 200 Marks
Duration of Exams. : 03 Hrs

The students expected to take up a project under the guidance of teacher from the college. The project must be based on Mechanical Engineering Auto problems, which can be extended up to the full academic session. The students may be asked to work individually or in a group not more than four students in a group. Viva- voce must be based on the preliminary report submitted by students related to the project.

B. Tech. (Seventh Semester) Mechanical Engineering (Auto)
Numerical/Methods and Optimization Technique lab
MEA 411 E

L	T	P/D	Total
-	-	2	2

Theory : 25 Marks
Sessional : 25 Marks
Total : 50 Marks
Duration of Exam: 03 hours

List of Experiments:-

1. Write Programs in 'C' Language: to deduce error envolved in polynomial equation.
2. Write Programs in 'C' Languagefor finding out the unknown values with the help of given set of observations using Newton's Forward Interpolation formula.
3. Write Programs in 'C' Languagefor finding out the unknown values with the help of given set of observations using Newton's Backward Interpolation formula.
4. Write Programs in 'C' Languagefor finding out the unknown values with the help of given set of observations using Langranges Interpolation formula.
5. Write Programs in 'C' Languagefor finding the root of an equation of the form f(x)=0 using Bisection method.
6. Write Programs in 'C' Languagefor finding the root of an equation of the form f(x)=0 using false position.
7. Write Programs in 'C' Language for finding the root of an equation of the form f(x) =0 using Iteration method.
8. Write Programs in 'C' Languagefor finding the root of an equation of the form f(x) =0 using Newton- Raphson method.
9. Write Programs in 'C' Language to fit a straight line for a given set of data points.
10. Write Programs in 'C' Language to fit a second-degree parabola for a given set of data points.
11. Write Programs in 'C' Language to find out a numerical integration using Trapezoidal rule.
12. Write Programs in 'C' Language to find out a numerical integration using Simpson's 1/3 rule.
13. Write Programs in 'C' Language to find out a numerical integration using Simpson's 3/8 rule.
14. Write Programs in 'C' Language to Compute the solution of differential equation by Taylor's series Method.
15. Write Programs in 'C' Language to compute the solution of differential equation by Euler's modified method.

Note: Total Ten experiments must be performed. At least eight experiments should be performed from the above list. Remaining two experiments may either be performed from the above list or outside the list.

B. Tech. (Seventh Semester) Mechanical Engineering (Auto)
In Plant Training Report
ME 413 E

P/D	Total	
-	-	Sessional : 125 Marks
		Duration of Exams. : 03 Hrs

Student will submit summer training (about 8 weeks' industrial training) report for his/her assessment.

Elective-I Seventh Semesters
Mechanical Engineering (Auto)

ELECTIVE – I

ME 421E	Finite Element Method
ME 423E	Applied Numerical Techniques and Computer Programming
ME 427E	Machine Tool Design
ME 435 E	Renewable Energy Resources
ME 437E	Maintenance Engineering

B. Tech. (Seventh Semester) Mechanical Engineering (Auto)
Finite Element Method
ME 421 E

L	T	P/D	Total
4	1	-	5

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exams. : 03 Hrs

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Basic Concept, Historical background, Engineering applications, general description, Comparison with other methods. Need for weighted-integral forms, relevant" mathematical concepts and formulae, weak formulation of boundary value problems, variational methods, Rayleigh-Ritz method, and weighted residual approach.

UNIT II

Model boundary value problem, finite element discretization, element shapes, sizes and node locations, interpolation functions, derivation of element equations, connectivity, boundary conditions, FEM solution, post-processing, compatibility and completeness requirements, convergence criteria, higher order and isoparametric elements, natural coordinates, Langrange and Hermite polynomials.

UNIT III

External and internal equilibrium equations, one-dimensional stress-strain relations, plane stress and strain problems, axis-symmetric and three dimensional stress-strain problems, strain displacement relations, boundary conditions, compatibility equations, computer programs.

UNIT IV

Variational approach, Galerkin approach, one-dimensional and two-dimensional steady-state problems for conduction, convection and radiation, transient problems. In viscid incompressible flow, potential function and stream function formulation, incompressible viscous flow, stream function, velocity-pressure and stream functionvorticity formulation, Solution of incompressible and compressible fluid film lubrication problems

Reference and Text Books:

1. The Finite Element Method - By Zienkiewicz, Tata McGraw
2. The Finite Element Method for Engineers -By Huebner, John Wiley
3. 3. An Introduction to the Finite Element Method -By J.N.Reddy, McGraw Hill

B. Tech. (Seventh Semester) Mechanical Engineering (Auto)
Applied Numerical Techniques and Computer Programming
ME 423 E

L	T	P/D	Total
4	1	-	5

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exams. : 03 Hrs

NOTE:

1. The Instructor of the course may cover the use of software MATHEMATICA, in the tutorial class.
2. In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

Unit I

Interpolation and Curve Fitting : Lagrangian Polynomials, Divided differences, Interpolating with a cubic spline, Bezier Curves and B-Spline Curves, Polynomial approximation of surfaces, Least Square approximations, Flow Chart for Computer Programmes.

Unit II

Solving Non-Linear Equations: Bisection Method, Linear Interpolation Methods, Newton's Methods, Muller's Methods, Fixed-point Iteration Method, Flow Chart for Computer Programmes.

Solving Sets of Equations: The Elimination Method, Gauss and Gauss Jordan Methods, Other Direct Methods, Iterative Methods, The Relaxation Methods, Flow Chart for Computer Programmes.

Unit III

Numerical Differentiation and Integration: Derivatives from difference tables. High Order Derivative, Extra-polation Techniques. The Trapezoidal Rule, Simpson's Rules. Flow Chart for Computer Programmes. Numerical Solution of Ordinary Differential Equations: The Taylor-Series Method, Euler and modified Euler-Methods, Range-Kutta Methods, Miline's Method. The adams-Moulton Method, Convergence Criteria, Errors and error Propagation. Flow Chart for Computer Programmes.

Unit IV

Boundary-Value and Characteristic- Value Problems: The Shooting Method, Rayleigh-Ritz Method, Collocation Method, Galerkin Method, The Power Method for Eigenvalues by Iteration. Flow Chart for Computer Programmes. Numerical Solution of Partial Differential Equations: (A) P.D.equation representation as a difference equation, Iterative Methods for Laplace's Equation. The Possion Equation, Derivative Boundary Conditions. (B) The Crank-Nicolson Method for Parabolic Partial Differential Equations. Flow Chart for Computer Programmes.

Text Books :

1. Applied Numerical Analysis by Curtis f. Gerald and Patrick O. Wheatley – Published by Addison Wesley.
2. Introductory Methods of Numerical Methods – S.S. Sastry, PHI, New Delhi.

Reference Books:

1. MATHEMATICA – A system for doing mathematics by Computer by Wolfram, Stephen – Published by Addition – Wesley.
2. Applied Numerical Methods by Camahan, Brice,Et.al, Published by Wiley, New York.
3. Numerical Solution of partial differential equations by Smith, G.D. Published by Oxford University Press London.
4. Iterative Methods for the solution of Equations by J.F. Traub – Published by Prentice Hall.
5. Numerical Methods in Engineering and Science by B.S. Grewal- Published by Khanna Publishers.
6. Numerical Methods in Engineering by M.G. Salvadori and M.L. Baron- Published by Prentice Hall India.

B. Tech. (Seventh Semester) Mechanical Engineering (Auto)
Machine Tool Design
ME 427 E

L	T	P/D	Total
4	1	-	5

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exams. : 03 Hrs

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Definition and classification, Corking and auxiliary motion in m/c tools, parameters of working motion, machine tool drive, selection of electric motor, hydraulic and mechanical transmission and their elements, general requirement of m/c tool design. Engineering design process for m/c tool, and techno-economical consideration for design of new m/c tool. Aims, stepped and stepless speed regulation, design of speed and feed gear box, m/c tool drives using multiple speed motors, gear box kinematics design, gearing diagram, no. of teeth, no. of teeth on gears in the gear train, classification speed and feed boxes, numerical problems.

UNIT II

Function and requirements, design criteria, criteria of selection of materials, static arid dynamic stiffness, profiles for m/c tool structure, stiffness, design procedure for m/c tool structure, numerical problems. Function and types, profiles, material and clearance in slide ways, analysis of design of slide ways for wear and stiffness design of hydrostatic guide ways, aerostatic slide ways and antifriction guide or sliding friction power screws for wear, strength, friction bucking stability design of rolling friction, power screw for stiffness, numerical problems.

UNIT III

Function and requirements, material for spindle, effect of m/c tool compliance on machining accuracy, design of spindles for bending, permissible deflection strength, optimum spacing for spindle support, antifriction and different types of sliding bearings and their general characteristic, air lubricated bearing, numerical problems.

UNIT IV

Equivalent Elastic System (EES), general procedure for accessing dynamic stability of EES cutting process closed loop system dynamic characteristics of elements, systems, EES and culling process, stability analysis, forced vibration of machine tools. Function requirements and classification, control system for forming and auxiliary motion, manual control systems, ergonomic considerations, automatic control systems and adaptive control system.

Text Books:

- Machine Tool Design & Numerical Control by N.K. Mehta, Published by TMH.
- Production Technology by R.K. Jain, Published by Khanna Publishers.

References Books:

1. Design of M/c Tool by S.K. Basu, Allied Publisher, New Delhi.
2. Principles of M/c Tool by Ballacharya A. and Sen. G.C., Published by New Central Book Agency, Calcutta.
3. Machine Tool Design -Vol-IV- by Acherkean N., Published by Mir Publication.
4. Design principles of Metal Cutting Machine Tools by Koenigsberyer F., Published by Pergrnan Press, Oxford.

B. Tech. (Seventh Semester) Mechanical Engineering (Auto)
Renewable Energy Resourses
ME 435 E

L	T	P	Total
4	1	-	5

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exams. : 03 Hrs

NOTE: In the semester examination, the paper setter will set 8 questions in all, two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT-I

Introduction and Essential of Fluid Mechanics and Meat Transfer Fundamentals and scientific principles of renewable energy resources, technical and social implications, Bernoulli's, equation, conservation of momentum, viscosity, turbulence, friction and pipe flow, heat circuit analysis and terminology, conductive, convective and radiative heat transfers, properties of transparent materials, heat transfer by mass transport, multimode heat transfer and circuit analysis, problems.

UNIT-II

Extraterrestrial solar radiation, components of radiation, geometry of earth and sun, geometry of collector arid the solar beam, effects of earth's atmosphere, measurements of solar radiation, calculation of heat balance for a solar collector, type of water heaters, selective surfaces, crop heaters, space heating, space cooling, water desalination, solar ponds, solar concentrators, electric power system, problems. Introduction, the silicon p-n junction, photon absorption solar radiation input,
photovoltaic circuit properties and loads, limits to cell efficiency, solar cell construction type and adaptations of photovoltaic, other types of photoelectric and thermo electric generation, problems.

UNIT III

Principles of hydro power, assessing the resource for small installations, an impulse turbine, reaction turbines, hydro electric systems, the hydraulic rain pump, wind turbine types and terms, linear momentum and basic theory, dynamic matching, steam tube theory, characteristics of the wind, power extraction by a turbine, electricity generation, mechanical power, problems. Introduction, tropic level photosynthesis, photosynthesis at the plant level, thermodynamic considerations, photosynthesis, molecular level photosynthesis, synthetic photosynthesis, bio fuel classification, bio-mass production for energy farming, direct combustion for heat, pyrolysis (destructive distillation), alcoholic fermentation, anaerobic digestion for bio-gas, agrochemical fuel extractions, problems.

UNIT IV

Introduction, wave motion, wave energy and power, ;wave patterns, devices, the causes of tides, enhancement of tides flow power, tidal range power, world range power sites, problems. Principles of Ocean Thermal Energy Conversion (OTEC), heal exchangers, pumping requirements, other practical considerations, introduction to geothermal energy, geophysics, dry rock and hot aquifer analysis, harnessing geothermal resources, problems.

Text Books:

1. Renewable Energy Rsources by John W. Twidell and Anthony D. Weir, published by E.& F. N. Spon Ltd. London.

B. Tech. (Seventh Semester) Mechanical Engineering (Auto)
Maintenance Engineering
ME 437 E

L	T	P/D	Total
4	1		5

Sessional : 50 Marks
Theory : 100 Marks
Total : 150 Marks
Duration of Exams. : 03Hrs

NOTE: In the semester examination, the paper setter will set 8 questions in all, at least two questions from each unit, and students will be required to attempt only 5 questions, selecting at least one from each unit.

UNIT I

Evolution of maintenance, objective of maintenance, maintenance policies and philosophies, maintenance concept, maintenance management & terotechnology, relationship with other functional areas, importance of maintenance, elements of good maintenance, economics of maintenance, training and safety aspects in maintenance. Classification of maintenance programs, corrective preventive and predictive maintenance, comparison of maintenance programs, preventive maintenance-concept, functions, benefits, limitations.

UNIT II

Objectives, what to monitor, when to monitor, principles of CBM, condition based maintenance techniques, manual inspections, performance monitoring, vibration monitoring, current monitoring, coil debris/spectroscopy, thermography and corrosion monitoring, steps in implementation of CBM, benefits of CBM. RCM logic, maintenance and RCM, benefits of RCM, total productive maintenance (TPM), introduction, key supporting elements of TPM, methodology, evaluation and benefits.

UNIT III

Purpose and challenges: Techniques, visual aids-boroscopes, endoscopes, fiber optics scanners, magnetic particles inspection, liquid penetrants, eddy current, ultrasonic radiography, selection of NDT technique, metrits/demerits and applications of various techniques. Basic ingredients, basic steps in maintenance management, maintenance planning and control system, documentation, maintenance-productivity areas for improvement

UNIT IV

Techniques for improvement of operational reliability, safety and availability of machines and production systems, maintainability criteria, checklist to assess the maintainability of a system, maintainability programs, objectives, key issues in availability improvements program, fault diagnosis, Pareto principle Ishikawa diagram. Data processing systems for integrated maintenance, maintenance information and reporting systems.

Text Books:

1. Maintenance Planning and Control by Higgin L.R., McGiaw Hill Book Co1, 1900
2. Maintenance Planning and Control by Kelly Anthony, East West Press Private Ltd, New Delhi, 1991.
3. Maintainability principle and practices by Blanchard B.S. and Lowey E.E. McGrawHill Book co.
4. Practical NOT by Raj B. Jaya Kumar T and Thavasimulyi K., Narora Publishing House, New Delhi, 1996.
5. Engineering Maintenance Management by Niebel Benjamin W. Marcel Dekher, 1994.