Faculty of Engineering & Technology

NORTH MAHARASHTRA UNIVERSITY, JALGAON (M.S.)

THIRD YEAR ENGINEERING (T.E.)

(MECHANICAL ENGINEERING)
TERM-I & II

W.E.F.: 2007-08

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (MECHANICAL)
W.E.F.: 2007-08
TERM-I
Heat Transfer and Mass Transfer
(Common with Automobile Engineering)

Teaching Scheme	Examination Scheme
Lectures: 4 Hrs/ week.	Paper: 3 Hours
Practical: 2Hrs/week.	Paper: 100 Marks
	Practical: 25 Marks
	Term Work: 25 Marks

Unit-I **(10 Hours)**

Concepts and Mechanism of heat flow: Steady and unsteady state heat transfer, Modes of heat transfer, their physical mechanism, Laws of heat transfer, thermal conductivity, heat transfer coefficient, radiation heat transfer coefficient, isotropic and an-isotropic materials. Insulation materials. Thermal resistance and thermal conductance.

Steady state heat conduction without heat generation in plane and composite wall, hollow cylinder, hollow sphere, Thermal contact resistance, critical thickness of insulation on cylindrical bodies.

Generalized one dimensional heat conduction equation and reduction to Fourier, Poisson and Laplace equations. Boundary conditions. Steady state heat conduction with heat generation in plane wall, cylinder and sphere.

(20 Marks)

Unit –II **(10 Hours)**

Extended Surface: Types of fins, governing equation, Fin performance, fin efficiency, fin effectiveness, overall fin effectiveness, approximate solution of fins. Error in temperature measurement by thermometer.

Thermal radiation: Concept, Black body radiation, Spectral and total emissive power, Stefan Boltzmann law, Radiation laws, irradiation and radiosity, Surface absorption, reflection and transmission, emissivity, Radiation view factor, Properties of view factor, (*No numerical treatment on view factor*), radiation heat exchange between two diffuse gray surface, radiation shield. **(20 Marks)**

Unit-III **(10 Hours)**

Principle of heat convection: mechanism, natural and forced convection, convection boundary layers: laminar and turbulent, momentum and energy equation an, Laminar flow over bodies, turbulent flow inside circular and non-circular ducts, Reynolds Colburn analogy for flow over flat plate and flow inside tube, coefficient of friction and friction factor, Heat transfer in fully developed flow, Natural convection over vertical planes, use of empirical correlation for forced and natural convection. Dimensional analysis.

Principle of condensation and boiling (No numerical treatment)

(20 Marks)

Unit-IV **(10 Hours)**

Classification of heat exchangers, temperature distribution in parallel, counter flow arrangement, condenser and evaporator, overall heat transfer coefficient, fouling factor, Log-mean temperature difference method and NTU –effectiveness method of analysis for rating and sizing of heat exchangers. Requirement of good heat exchanger and heat exchanger and design and selection, practical applications, heat pipe. **(20 Marks)**

Unit-V **(10Hours)**

Mass Transfer

Introduction, Modes of Mass transfer, Concentrations, Velocities and fluxes, Concentrations, Velocities, Fluxes, Fick's Law, General Mass Diffusion Equation in Stationary Media, Steady State Diffusion Through a Plain Membrane, Steady-State Equimolar Counter Diffusion, Isothermal evaporation of Water into Air from a Surface, Mass Transfer Coefficient, Convective Mass Transfer, Correlations for Mass Transfer **(20 Marks)**

Note for paper setter:

Paper setter should provide the required data for numerical problems in question paper it self. No use of data book should allow.

Experiment must be set simultaneously and the no. of student in each group working on a setup shall not exceed 05 (five) student.

Any **Eight** Experiments from the following list:

1) Determination of thermal conductivity of metal rod.
2) Determination of thermal conductivity of insulating powder.
3) Determination of thermal conductivity of composite wall.
4) Determination of heat transfer coefficient in natural convection.
5) Determination of heat transfer coefficient in forced convection.
6) Determination of temperature distribution, fin efficiency in natural and forced convection.
7) Determination of emissivity of a test surface.
8) Determination of Stefan Boltzmann constant.
9) Study of pool boiling phenomenon and determination of critical heat flux.
10) Determination of log-mean temperature difference, overall heat transfer coefficient and effectiveness of heat exchanger in parallel and counter flow arrangement.
11) Determination of heat transfer from a heat pipe.
12) Calibration of thermocouple.

Instructions for practical Exam. :-

1. Five experiments shall be selected for Practical Examination.
2. The Number of Students for each Practical set up would not be more than 5 Students.

3. Oral will be based on the Practical Performed in the examination and the experiments included in the Journal.

Recommended Books :

1) J.P.Holman 1992 “Heat Transfer”Mc Graw Hill VII Edition.
2) P.Kothandaraman ,”Fundamentals Of Heat And Mass Transfer”.
3) R.K.Rajput,”Heat And Mass Transfer”, S.Chand & Company Ltd.,New Delhi.
4) D.S.Kumar “Heat And Mass Transfer” D.S.Kumar S.K.Kataria & Sons,Delhi.
5) P.K.Nag, “Heat Transfer” Tata Mcgraw Hill Publishing Company Ltd.,New Delhi.
6) Sachdeva R.C., “Fundamentals Of Heat And Mass Transfer” Wiley Eastern Limited, Third Edition.
7) Sukhatme S.P, “A Text Book On Heat Transfer” (1989) , IIIrd Edition, Orient Longmans Ltd., New Delhi.
8) Arora S.C. & Domkundwar S., “A Course In Heat And Mass Transfer” (1994) , Dhanpat Rai & Sons, IVth Edition.
9) Chapman A.J., “Heat Transfer” (1989), , IVth Edition.
10) Yunus A. Cengel, “Heat Transfer –A Practical Approach” (Tata McGraw Hill)
11) M. M. Rathore “Engineering Heat and Mass Transfer”, 2nd Edition, Laxmi Publications, New Delhi.
12) M. Thirumalseshwar,”Fundamentals Of Heat And Mass Transfer” Pearson Education.
13) R. Rudramoorthy, K. Mayilsomy, “ Heat Transfer”, Pearson Education.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (MECHANICAL)
W.E.F.: 2007-08
TERM-I
Machine Design I

Teaching Scheme	Examination Scheme
Lectures: 4 Hrs/ week.	Paper: 4 Hours
Practical: 2Hrs/week.	Paper: 100 Marks
	Oral: 25 Marks
	Term Work: 25 Marks

UNIT:- I Introduction and Design of Simple Machine Parts (10 hours)

a) Design Process

Machine Design, Traditional design methods, Basic procedure of Machine Design, Requisites of design engineer, Design of machine elements, Sources of design data, Use of standards in design, Selection of preferred sizes, Design synthesis, Creativity in design.

b) Stresses and Material Properties

Simple stresses- Tension, compression, bending and torsion, combined effect of different stresses, different material properties

c) Theories of Failures

Maximum principal Stress Theory, Maximum shear stress theory, Maximum principal strain Theory, Maximum strain energy Theory, Maximum Distortion energy Theory

d) Design of Simple Machine Parts

Factor of safety, Service factor, Design of simple machine parts-Cotter joint, Knuckle joint and Stresses in curved beams (for circular cross-section only).

(20 marks)

UNIT:-II Shafts, Keys and Couplings (10 hours)

a) Shafts

Design considerations in Transmission shafts, splined shafts, Shaft design on strength basis, Shaft design on torsional rigidity basis, A.S.M.E. code for shaft design,

b) Keys

Classification of keys, Design considerations in parallel and tapered sunk keys, Design of square, flat and Kennedy keys, Splines.

c) Couplings

Design considerations, Classification, Design of Rigid, Muff coupling, Flange coupling and Flexible bushed pin coupling. **(20 marks)**

UNIT:- III Threaded and Welded joints (10 hours)

a) Threaded Joints: Basic types of screw fastenings-cap screws and set screws, Bolts of uniform strength, Locking devices, I.S.O. metric screw threads, Bolts under tension, Eccentrically loaded bolted joint in shear, Eccentric load perpendicular to axis of bolt,

Eccentric load on circular base, Torque requirement for bolt tightening, Dimensions of standard fasteners, Design of cylinder bolts and turn buckle.

b) Welded Joints

Advantages and limitations of welded joints, Butt and fillet welds, Stresses in butt and fillet welds, Strength of butt welds, parallel and transverse fillet welds, Axially loaded unsymmetrical welded joint, Eccentric load in plane of welds, Welded joint subjected to bending and torsional moments

(20 marks)

UNIT:-IV Power Screws and Mechanical Springs (10 hours)

a) Power Screws

Power screw thread forms, Multiple threaded screws, Torque analysis with square and trapezoidal threads, Self-locking screw, Collar friction torque, Stresses in power screws, Screw jack design.

b) Mechanical Springs

Types, Applications and materials of springs, Stress and deflection equations for helical springs, Style of ends, Design of helical compression and tension springs, Springs in series and parallel, Concentric helical springs, Helical torsion spring, Multi-leaf spring, Shot peening**.** **(20 marks)**

UNIT:- V Design for variable Loads and Statistical consideration in Design (10 hours)

a) Design for Fluctuating Loads

Stress concentration - causes and remedies, Fluctuating stresses, Fatigue failure, S-N curve, Endurance limit, Notch sensitivity, Endurance strength modifying factors, Reversed stresses, Design for finite and infinite life, Cumulative damage in fatigue failure, Solderberg and Goodman diagrams, Modified Goodman diagram, Fatigue design of components under combined stresses such as shafts, bolts and springs.

b) Statistical consideration in design

Frequency distribution – Histogram and frequency polygon – Normal distribution – Units of measurement of central tendency and dispersion – Standard variable – population combinations – Design and natural tolerances –Design for assembly- Statistical analysis of tolerances – Mechanical reliability and factor of safety. **(20 marks)**

Term Work:

1) Term work shall consist of **TWO** design projects. Each design project shall consist of two imperial size sheets –one involving assembly drawing with a part list and overall dimensions and other sheet involving drawings of individual components. Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified so as to make it working drawing. A design report giving all necessary calculations of the design of components and assembly should be submitted in a separate file.

Design projects should be in the form of ‘Design of Mechanical System’ comprising of machine elements studied and topics covered in the syllabus. Design data book shall be used wherever necessary to achieve selection of standardized components.

2) Problem based assignment on each unit

Recommendation:

As far as possible, preference should be given to prepare drawing sheets using computer.

Recommended Books :

1) Shigley J.E. and Mischke C.R., “Mechanical Engineering Design”, McGraw Hill Publication Co. Ltd.
2) Spotts M.F. and Shoup T.E. , “Design of Machine Elements” , Prentice Hall International.
3) Bhandari V.B., “Design of Machine Elements”, Tata McGraw Hill Publication Co. Ltd.
4) Black P.H. and O. Eugene Adams, “Machine Design” , McGraw Hill Book Co. Inc.
5) Willium C. Orthwein, “Machine Components Design”, West Publishing Co. and Jaico Publications House.
6) Design Data”, P.S.G. College of Technology, Coimbatore.
7) Juvinal R.C., “Fundamentals of Machine Components Design”, John Wiley and Sons.
8) Hall A.S., Holowenko A.R. and Laughlin H.G., “Theory and Problems of Machine Design”, Schaum’s Outline Series.
9) P. Kannaiah, “Machine Design”, Scitech publication

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (MECHANICAL)
W.E.F.: 2007-08
TERM-I
NUMERICAL ANALYSIS AND COMPUTATIONAL METHODS

Teaching Scheme	Examination Scheme
Lectures: 4 Hrs/ week.	Paper: 3 Hours
Practical: 2Hrs/week.	Paper: 100 Marks
	Term Work: 25 Marks

Unit-I **(10 Hours)**

A) Software development -

Software development principles mathematical modeling problem solving, Algorithm, Flowchart , Errors , Graphical method,

B) Solution of transcendental equation -

Bisection method, False position method, successive approximation method, Newton-Raphson method, Horner's method, rate of convergence.

(20 Marks)

Unit-II **(10 Hours)**

A) Numerical Integration

Trapezoidal rule, Simpson's 1\3rd rule, Simpson's 3\8th rule, Gauss quadrature technique,

B) Solution of ordinary Differential Equation

Taylor's series method, Euler's method, Improved & modified Euler's method, Fourth order Range- Kutta method. **(20 Marks**)

Unit-III **(10 Hours)**

A) Interpolation -

Linear and quadratic interpolation, Lagrange's interpolation, Newton's forward interpolation, Newton's backward interpolation, Newton's divided difference interpolation, Stirling interpolation,

B) Curve fitting

Linear & quadratic regression, Logarithmic curve fitting, Exponential curve fitting.

(20 Marks)

Unit-IV **(10 Hours)**

A) Solution of Linear Algebraic Equation -

Gauss elimination method , Gauss Jordan method LU- decomposition method ,

B) Iterative method -

Jacobi iteration method, gauss seidel interactive method, Cholesky method convergence analysis, choice of method. **(20 Marks**)

Unit-V **(10 Hours)**

A) Finite Difference Method

Solution of ordinary differential equation, solution of elliptical equation for various boundary condition, solution of parabolic equation by explicit , implicit and crank-Nicolson method ,

B) Finite Element Method

Finite element method introduction, comparison with finite difference method, general approach, interpolation function, finite element application on one dimensions

(20 Marks)

Term-Work:

Scope of programming should be restricted to practical class only.

Assignments: (Term work include only **EIGHT** assignments.)

1. Introduction to C – Language
   Simple input output, formatted various, if statement, loops, array functions & subroutine introduction algorithm development, flowchart.
2. General program like sorting, conditional interest etc.
3. Solution of quadratic equation.
4. Solution of transcendental (exponential or logarithmic) equation related with engineering application.
5. Calculation of work/heat transferred by using any integration method.
6. One exercise on numerical integration related to mechanical engineering application.
7. Solution of Poisson equation.
8. Solution of one dimensional parabolic equation by Crank-Nicolson method.
9. Curve fitting for the data related to mechanical engineering application.
10. Solution of one/two dimension problem by finite element method using any compatible software.
11. Interpolation for any tabulated data used in mechanical engineering.

Recommended Books:

1) Chapra, Canale," Numerical Method for Engineer",McGraw Hill Co.
2) Joh. H. Mathews," Numerical Methods", Pearson Education.
3) P. Kandaswamy," Numerical Methods",S. Chand & Co. New Delhi.
4) J. N. Reddy," Finite Element Method",McGraw Hill Co.
5) Jain, Jain & Iyangar," Numerical Method for Scientist & Engineering Computation",New Age International Pvt. Ltd.
6) S. S. Shastri," Introductory Method of Numerical Analysis ",Prentice Hill India.
7) Belegundupatla," Introduction to Finite Element Method",Prentice Hill India.
8) Y. Kanitkar, "Let us C", BPB Publications
9) Balgurusamy, "Programming in C", TMH

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (MECHANICAL)
W.E.F.: 2007-08
TERM-I
THEORY OF MACHINE – II
(Common with Automobile Engineering)

Teaching Scheme	Examination Scheme
Lectures: 4 Hrs/ week.	Paper: 3 Hours
Practical: 2Hrs/week.	Paper:100 Marks
	Oral: 25 Marks
	Term Work:25 Marks

UNIT:-I BRAKES AND DYNAMOMETERS (10 Hours)

A} BRAKES: - a) Types of brakes, b) Force analysis of brakes, external and internal expanding shoe brakes, block brakes, band brakes, block and band brakes, c) Breaking torque.
B} Dynamometer: - a) Absorption dynamometers: prony brakes, rope brake, band brake, transmission dynamometer- belt transmission type, b) Eddy current dynamometer: construction and working principle, c) Torque measurement, d) Fluid coupling. **(20 marks)**

UNIT:- II KINEMATICS OF CAM AND FLYWHEEL (10 Hours)

A} CAM: - a) Types of cams and followers, b) Analysis of motion of follower, c) Determination of cam profile for given follower motion, d) Analysis of cam with specified counters – circular arc cam, tangent cam, e) Cycloidal cam, polydyne cam, kinematics equivalent of cam.
B} FLYWHEEL: - a) Turning moment diagram and fluctuation of the crankshaft speed, D' Alemberts principle b) Equivalent offset inertia force, c) Determination of flywheel size for different types of engine and machine.

(20 marks)

UNIT- III MECHANISMS FOR CONTROL – GOVERNORS AND GYROSCOPES: (10 Hours)

A} GOVERNOR: a) Types of governors – Watts, Porter, Proel, Hartnell governor, b) Sensitiveness of governors, c) Hunting, Isochronisms, stability, d) Effect of governor, e) Power of governor, controlling force.
B) GYROSCOPE: a) Angular velocity and acceleration, b) Gyroscopic forces and couple, c) Gyroscopic effect on naval ships, d) Gyroscopic stabilization, stability of two wheel vehicle. **(20 marks)**

UNIT–IV GEAR AND GEAR TRAIN **(10 Hours)**

GEAR:

a) Spur Gears:- Terminology used in gears, conjugate action, in volute and cycloidal profile, path of contact, arc of contact, contact ratio, interference, undercutting, methods to avoid undercutting and interface, gear standardization, effect of center distance variation on the velocity ratio for involute profile tooth gears, friction between gear teeth.

b) Helical Gears: - Torque transmitted by helical gears on parallel shafts, normal and transverse module.

c) Spiral Gears: - Spiral angle, shaft angle, and efficiency of spiral gear.

d) Worm and Worm Gear: - Terminology and geometrical relationship, efficiency of worm gears.

GEAR TRAINS: - Types of gear trains, velocity ratio, tooth load, torque transmitted Holding torque **(20 Marks)**

UNIT: - V BALANCING: **(10 Hours)**

Balancing of rotating masses in one and several planes

Balancing of reciprocating masses in single and multi-cylinder engine, radial and V-types.

Primary and secondary balancing analysis,

Concept of direct and reverse cranks.

Balancing of locomotive engines and effect of partial balancing.

Static and dynamic balancing machine. **(20 marks)**

Term-Work:

Term work shall consist of any '**EIGHT**' experiments of the following: -

1) Study of various types of gearboxes such as industrial gearboxes, Synchromesh gearbox, Differential gearbox.
2) To draw the conjugate profile for any general shape of gear tooth.
3) To generate gear tooth profile and to study the effect of undercutting and rack shift using models.
4) To determine torque capacity of dynamometer.
5) To study epi-cyclic gear train and to measure torque transmitted and holding torque.
6) To draw cam profile for various types of follower motion.
7) To determine the characteristics curve of a centrifugal governor and to find its coefficient of insensitiveness and stability.
8) Verification of principle of gyroscopic couple.
9) Study of any two gyro controlled instruments.
10) To study the dynamic balancing machine and to balance a rotor.
11) Study of different types of brakes.
12) Study of gyroscopic effect on Naval ship and Four wheel vehicle.

ORAL:

Oral will be based on the prescribed term-work presented in the form of certified journal only.

Recommended Books:

1) Thomas and Bevan, “Theory of Machines” Tata Mc Graw Hill
2) P.L.Balany, “Theory of Machines and Mechanisms”, Khanna Publications.
3) Jagdishlal, ”Theory of Machines and Mechanisms” Metropolitan Book Company.
4) S.S.Ratan , “Theory of Machines and Mechanisms” Tata Mc Graw Hill
5) Shigley, “Theory of Machines and Mechanisms” Mc Graw Hill International
6) Sadhu Singh, “Theory of Machine” Pearson Education
7) J.S.Rao, ”Theory of Machines” New Age International Publishers.
8) J.S.Rao, “Theory of Machines”, New Age International Publishers.
9) J Srinivas, “ Mechanism and Dynamics of Machinery “, Scitech Publication.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (MECHANICAL)
W.E.F.: 2007-08
TERM-I
INTERNAL COMBUSTION ENGINE
(Common with Automobile Engineering)

Teaching Scheme	Examination Scheme
Lecture: 4 Hour/Week	Paper: 3 Hours
Practical: 2 Hours/Week	Paper: 100 Marks
	Term Work: 25 Marks

UNIT:- I BASIC CONCEPTS AND ENGINE CYCLES (10 hours)

Availability of energy (Elementary treatment only): Introduction to available and unavailable energy, availability of system with heat transfer. Entropy generation and second law efficiency. (No numerical treatment on above contents)

Introduction, Classification, engine components and their functions, Terminology, Work (indicated and brake), mean effective pressure, torque and power (brake and indicated), mechanical efficiency, thermal and volumetric efficiencies of engine, air fuel ratio, specific fuel consumption.

Air Standard Cycles: Assumptions, Otto, Diesel, Dual Combustion cycle, derivation of their efficiency equation, work done and mean effective pressure. Comparison on the basis of heat input, compression ratio, Maximum pressure and temperature, Actual cycle, deviation from theoretical cycles. Pumping losses, time losses, Stirling and Ericsson cycle.

(20 Marks)

UNIT:- II FUEL FEEDING SYSTEMS (10 hours)

Charge, intake valve and manifold, valve timing diagram, valve overlap, choked flow.

Carburetion: Requirement, types of carburetors according to fluid flow, simple carburetor, Air fuel ratio calculation, effect of altitude, disadvantages of simple carburetor, compensating devices for starting, economy range, acceleration, compensating jet etc. additional systems in modern carburetors, Solex carburetor. Disadvantages of carburetion and gasoline injection, MPFI.

Fuel feeding systems in CI engines: Requirement, classification, fuel feed pump, jerk type injection fuel pump, distributor type pump, injection pump governor, fuel injector and nozzles. **(20 Marks)**

UNIT:- III OPERATING SYSTEMS (10 hours)

Cooling systems: requirement, types of cooling systems, thermostat and additives.

Lubrication: Mechanism of lubrication, different methods, important properties of lubricating oils.

Governing of IC engines: requirement, quantity, quality, hit and miss type governing.
Ignition Systems: requirement, battery ignition, magneto ignition, electronic ignition system in two stroke engines, Ignition timing, spark timing advance.
Starting methods of engines. types of superchargers, Super charging, effect of super charging, limitations and advantages of supercharging, and turbo charging of engines.

(20 Marks)

UNIT:- IV COMBUSTION IN SI AND CI ENGINES (10 hours)

Homogeneous and heterogeneous mixtures, Combustion in SI engines: Stages in combustion, Ignition lag, velocity of flame propagation, factors influencing flame speed, rate of pressure rise, Detonation, factors affecting the detonation, pre-ignition. Rating of SI engines fuels, Dopes, combustion chamber of SI engines.
Combustion in CI engine; stages of combustion, factors affecting the delay period. Diesel knock, Effect of engine variables on Diesel knock , Rating of CI engine fuels: Cetane number, performance number, comparison of knock in SI and CI engines. Combustion chamber for CI engines.

(20 Marks)

UNIT:- V ENGINE TESTING AND PERFORMANCE (10 hours)

Measurement of indicated power, brake power, Morse test, energy balance and efficiency calculations, BIS specification. Recent trends in internal combustion engines.
Engine emission, air pollution due to engines, EURO I and EURO II norms, Unburnt hydrocarbon emission in two stroke and CI engines, CO and Nox emission, particulate traps, EGR, emission control methods catalytic converters (Introductory), crank blow by losses. **(20 Marks)**

List of Experiments

Minimum **EIGHT** experiment should be performed form the following lists:
1) Study of cooling systems.
2) Study of lubrication systems.
3) Study of simple and Solex carburetors.
4) Study of fuel pump and fuel injector.
5) Trial on a petrol engine and calculation of air/fuel ratio, volumetric, thermal and mechanical efficiencies.
6) Trial of a Diesel engine and calculation of air/fuel ratio, volumetric, thermal and mechanical efficiencies.
7) Morse test and determination of bsfc and isfc.
8) Study of combustion chambers of SI engines.
9) Study of combustion chambers of CI engines.
10) Study and demonstration of mechanical and Pneumatic governors.
11) Study and analysis of exhaust emission from the engine (PUC).

Recommended Books :

1) V. Ganeshan, “Internal Combustion Engines”, 2/e, Tata McGraw Hill, New Delhi.
2) R. K. Rajput , “Internal Combustion Engines”’, Laxmi Publications, New Delhi.
3) W. W. Pulkrabek , “Fundamentals of Internal Combustion Engines”, Prentice Hall of India (P) Ltd., New Delhi.
4) E. F. Obert , “Internal Combustion Engines and Air Pollution”, Harper and Row, New York.
5) Ferguson C. R , “Internal Combustion Engines”, Wiley Inc. New York.
6) Sharma R.P. and Mathur M.L., “Internal Combustion Engines”, Standard Publications, New Delhi.
7) Domkundwar, ., “Internal Combustion Engines”, Dhanpat Rai & Co. New Delhi.
8) Willard W Pulkrabek. “Internal Combustion Engines”, Pearson Education
9) Shyam K. Agrawal, “Internal Combustion Engines”, New Edge International Publication.
10) K.K. Ramalingam, “Internal Combustion Engines”, Scitech Publication.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (MECHANICAL)
W.E.F.: 2007-08
TERM-I
COMPUTER PROGRAMMING IN C / C++
(Common with Automobile Engineering)

Teaching scheme	Examination Scheme
Practical: 2hrs/week	Term work: 25 marks

a) One assignment on introduction to computer

b) To develop and Run "C/C++" programs for machine elements like

(Any two on C and two on C++)

a) Design of knuckle joint or turnbuckle joint
b) Design of power screw
c) Design of helical spring
d) Design of splines
e) Design of muff coupling
f) Theories of failure etc.

Recommended Books:

1) Balgurusamy, "Programming in C" Tata McGraw Hill Publication Co. Ltd.
2) Y. Kanitkar, "Let us C" BPB Publications.
3) M. P. Grover and Zimmer, "CAD/CAM" PHI Pvt. Ltd.
4) Shigley J.E. and Mischke C.R. "Mechanical Engineering Design" McGraw Hill Publication Co. Ltd.
5) Spotts M.F. and Shoup T.E. "Design of Machine Elements" Prentice Hall International.
6) Bhandari V.B. "Design of Machine Elements" Tata McGraw Hill Publication Co. Ltd.
7) Balgurusamy, "Object Oriented Programming with C++" Tata McGraw Hill, New Delhi
8) Ravi Chandran, "Programming in C++" Tata McGraw Hill Publication Co. Ltd.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (MECHANICAL)
W.E.F.: 2007-08
TERM-I
Entrepreneurship Development Skill/ Human Research Training
(Common with Automobile Engineering and Production Engineering)

Examination Scheme
Term Work: 25 Marks

Study the following topic from Entrepreneurship Development from the literature/ books and submit a report it.

1) Introduction
- Entrepreneur
- Entrepreneur-ship.

2) Information gathering for identification of opportunity.
- Entrepreneurial process.

3) Information gathering techniques.

4) Product and Services
- Theory
- Product specifications.
- Market research, survey.
- Functions of marketing.
- Research and Development activity.

5) Procedures for estimation of resources required for establishment enterprise or starting service business.
- 5.1 Space.
- 5.2 Human Resources.
- 5.3 Equipments.
- 5.4 Financial Resources

6) Establishing and running enterprise
- Management of enterprise.
- Team spirit.
- Motivation.
- Communication

7) Budgeting and accounting expenditures for running enterprises.
- 7.1 Concept of budgeting.
- 7.2 Budget preparation.
- 7.3 Different type of budgets

8) Procedure of accounting expenditures
- 8.1 Preparation of P&L account and Balance sheet.

9) Quality Control

10) Procedure of report writing for getting approval from financial agencies.

10.1 Financial Resources.

10.2 Financial Corporations

OR

Attend a course of Entrepreneurship Development conducted by college and submit a report on it.

OR

Attend a course of H. R. Training conducted by college and submit a report on it.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (MECHANICAL)
W.E.F.: 2007-08
TERM-II
ENGINEERING METALLURGY
(Common with Automobile Engineering and Production Engineering)

Teaching Scheme	Examination Scheme
Lectures: 4 hrs. /week	Paper: 3 Hours
Practical: 2 hrs. /week	Paper: 100 marks.
	Term-work: 25 marks.

UNIT I : **(10 Hours)**

Metallography, Introduction, Microscopy and macroscopy, Sample preparation, sampling or sectioning, mounting, Grinding, Polishing Etching, Mechanism of Etching for single phase and multiphase alloys, Etching Reagents, Electrolytic polishing, Metallurgical microscope working principal Properties of lenses such as magnifying power, numerical aperture, Resolving power etc, Macroscopy, sulphur printing Flow line observations, Examination of fractures.

Steels: - Plain carbon steels, Iron – carbon Equilibrium Diagram, various phases in the diagram, various phase reactions identified in the diagram, solubility of carbon in iron, Allotropy, critical temperature, Microstructure of slowly cooled steels, estimation of carbon from microstructure, Non – Equilibrium cooling of steels. Specification of some commonly used steels for engineering applications.

(20 Marks)

UNIT II : **(10 Hours)**

Heat Treatment, Introduction, and Principles of heat treatment of steel, Transformation. Products of Austenite, Equilibrium diagrams as Aids, Heat Treatments for steel-principles & processes such as annealing, normalizing, Heat treatment used to incrase strength of steel, Isothermal tranformation Diagram, Tempering of martensite, oter heat treatment methods such as austempering, patenting,isoforming, martemperig, Ausforming,etc., continious cooling Transformation, Jominey Test for Hardenability, Hardenability considerations, Quenching media, Techinques to reduce the cracking,

(20 Marks)

UNIT III: **(10 Hours)**

Surface Hardening Treatments of steel : selective Heating Techniques, Flame Hardening, Induction and laser beam hardening, Electron beam hardening, Techniques Involving Altered surface chemistry, carburising, pack, Gas and liquid Carburizing, Nitrding,

Heat Treatment furnaces & Atmospheres : Furnace types, Furnace controls, Heat Treatment and energy, controlled atmosphere. **(20 Marks)**

UNIT IV: **(10 Hours)**

Engineering Alloy steels :- Effect of alloying elements, types of alloy steels, stain less steel, types,and Applications and method of selection. Sensitization and weld decay of stainless steel.Heat-treatment of high speed steels, classification and types tool steels, such as water hardening, shock resistance, cold work and Hot work tool steels and their heat treatment.

Cast irons: - classification, Effect of controlling eutectic reaction on microstructure and properties of cast iron, carbon Equivalent,white cast iron, malleable cast iron, gray cast iron, S.G.iron, chilled and alloy cast iron, Properties, specifications and applications in machine tools, Automobile and pump Industry. **(20 Marks)**

UNIT V: **(10 Hours)**

Engineering Non- Ferrous metals and Alloys : Introduction, Copper and it's alloys, Brasses and Bronzes, Copper-Nickel alloys, Aluminum and it's alloys, Bearing Materials, Lead, Tin and it's alloys Heat Treatment of Non- Ferrous metals, Precipitation or Age Hardening.

Composite Materials: Classification, different types of composite material and it's applications **(20 Marks)**

List of Experiments:

Note: Minimum **EIGHT** experiments must be performed out of following ten experiments.

1) Micro Specimen Preparation and use of metallurgical microscope, objective (a) To provide the practice in the techniques of micro specimen selection, grinding, polishing and etching; (b) To provide initial training in the use of metallurgical microscope

2) Study and drawing microstructure of low carbon, medium carbon, eutectoid steel, hypereutectoid steel in annealed condition.

3) Study and drawing microstructure of Gray, White, Malleable and Spheroidal Graphite Cast Iron.

4) Furnace operations and spark testing, objectives (a) to determine the natural (empty furnace) heating and cooling rates of an available laboratory furnace. (b) to draw the spark diagrams of low , medium, high carbon steel, cast iron, stainless steel

5) Sulphur print test on steel specimen or flow lines examination on forged components

6) Study of change in microstructure of annealed and normalized medium carbon steel, Objective (a) To anneal and normalized the sample of medium carbon steel in to the laboratory furnace and to find out hardness and microstructure of steel

7) Jomney Harden ability test, Objective (a) To conduct the Jomney harden ability test on two types of steel specimen.

8) To study the effect of carbon on hardness of harden and tempered steel

9) Study and drawing microstructure of alpha brass, alpha-beta brass, Aluminum Bronze and bearing metal

10) To study the effect of temperature on hardness of tempered steel

Recommended books:

1) E Paul Degarmo, J.T. Black, Ronald A. Kosher, “Material and Process In Manufacturing”, 9th Edition, John Wiley Inc.
2) V.D.Kodgire, “Material Science and Metallurgy for Engineers”, Everest Publishing House. Pune
3) B. K. Agrawal, “Introduction to Engineering Materials”, Tata Mcgraw Hill, New Delhi.
4) S.H. Avner, “An Introduction to Physical Metallurgy”, Tata Mcgraw Hill, New Delhi.
5)Raymond A.Higgins,” Engineering Metallurgy (Part I&II)”,ELBS Publication,London
6) Clark D.S.,” Physical Metallurgy for Engineers”, Affiliated East-West Press pvt. Ltd., New Delhi
7) Rollason A.C.,” Metallurgy for Engineers”, ELBS publication,London
8) W Calister, Material Science and Engineering, Wiley-Students Edition.
9) A.S.T.M./A.S.M. Hand books on Metallography, Steels, Heat Treatment of Steels & Furnaces
10) Kenneth G. Budinski and Michael K. Budinski, “ Engineering Materials Properties and Selection”, Pearson Education.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (MECHANICAL)
W.E.F.: 2007-08
TERM-II
Machine Design II

Teaching Scheme	Examination Scheme
Lectures: 4 Hrs/ week.	Paper: 4 Hours
Practical: 2Hrs/week.	Paper: 100 Marks
	Oral: 25 Marks
	Term Work: 50 Marks

UNIT:- I Friction Clutches and Brakes (10 Hours)

a) Friction Clutches:

Classification and selection of friction clutches, Torque transmitting capacities and Design of single-plate, multi-plate, cone and centrifugal clutches, Types of friction materials - their advantages, limitations and selection criteria.

b) Brakes:

Energy absorbed by brake, Design considerations in pivoted block brake with long shoe, internal expanding shoe brake and disk brake, Temperature rise in brake operation. **(20 marks)**

UNIT:- II Belts and Chain Drives (10 Hours)

a) Belts

Materials and construction of flat and V-belts, Geometric relationships for length of belt, Power rating of belts, Maximum power condition, Selection of flat and V-belts from manufacturer's catalogue, Belt tensioning methods, Relative advantages and limitations of flat and V-belts, Construction and applications of timing belts.

b) Chain Drives

Construction and materials of roller chain, Length of chain and number of links, Polygonal effect, Power rating of roller chains, Construction of sprocket wheels, Silent chains, Relative advantages and limitations of chain drives.

c) Aesthetic and Ergonomic considerations in Design

Asthetic considerations- Basic types of product forms, design features like shape,colour, materials and finishes, quality etc. Ergonomic considerations- Man-Machine closed loop system, design of display panels, design of controls etc. **(20 marks)**

UNIT:-III Spur and Helical Gear Drives (10 Hours)

Classification of gears, Selection of types of gears, Standard systems of gear tooth.

a) Spur Gears:

Number of teeth and face width, Types of gear tooth failure, Desirable properties and selection of gear material, Constructional details of gear wheel, Force analysis, Beam strength (Lewis) equation, Velocity factor, Service factor, Load concentration factor, Effective load on gear, Wear strength (Buckingham's and spott's) equation, Estimation

of module based on beam and wear strength, Estimation of dynamic tooth load by velocity factor and Buckingham's equation, Methods of gear lubrication.
b) Helical Gears:
Transverse and normal module, Virtual number of teeth, Force analysis, Beam and wear strengths, Effective load on gear tooth, Estimation of dynamic load by velocity factor and Buckingham's equation, Design of helical gears.

(20 marks)

UNIT:- IV Bevel and Worm Gear Drives (10 Hours)

a) Bevel Gears:
Straight tooth bevel gear terminology and geometric relationship, Formative number of teeth, Force analysis, Design criteria of bevel gears, Beam and wear strengths, Dynamic tooth load by velocity factor and Buckingham's equation, Effective load, Design of straight tooth bevel gears, Selection of materials for bevel gears, comparison of spiral bevel gears and hypoid gears and straight tooth bevel gears.
b) Worm Gears:
Worm and worm gear terminology and geometrical relationship, Types of worm and worm gears, Standard dimensions, Force analysis of worm gear drives, Friction in Worm gears and its efficiency, Worm and worm-wheel material, Beam strength and wear strength of worm gears, Estimation of dynamic load by velocity factor and Buckingham's equation, Thermal consideration in worm gear drive, Methods of lubrication. **(20 marks)**

UNIT:- V Rolling contact Bearings and Pressure Vessels (10 Hours)

a) Rolling Contact Bearings
Types of rolling contact bearings, Static and dynamic load carrying capacities, Striback's equation, Equivalent bearing load, Load-life relationship, Selection of bearing life, Selection of rolling contact bearings from manufacturer's catalogue, Design for cyclic loads and speed, Bearing with probability of survival other than 90%, Lubrication and mounting of bearings, Types of failure in rolling contact bearings - causes and remedies.
b) Design of Cylinders and pressure vessels: Thick and thin cylinders – Thin cylindrical and spherical vessels – Lame's equation – Clavarino's and Birnie's equations– Auto frettage and compound cylinders – Gasketed joints in cylindrical vessels. Unfired pressure vessels – Classification of pressure vessels as per I. S. 2825 – categories and types of welded joints – weld joint efficiency – Corrosion, erosion and protection vessels, stresses induced in pressure vessels, materials of construction. Thickness of cylindrical and spherical shells and design of end closures as per code – Nozzles and Openings in pressure vessels –Reinforcement of openings in shell and end closures. Area compensation method. **(20marks)**

Term Work

1.Term work shall consist of "ONE" design project. The design project shall consist of two imperial size sheets – one involving assembly drawing with a part list and overall dimensions and the other sheet involving drawing of individual components.

Manufacturing tolerances, surface finish symbols and geometric tolerances should be specified so as to make it working drawing. A design report giving all necessary calculations of the design of the components and assembly should be submitted in a separate file.

Design projects should include selection of prime mover and design of mechanical systems comprising of machine elements:

Spur gears and helical/bevel/worm gears OR Belt/chain/rope and clutch/brake etc.

Design data book shall be used extensively for the selection of the components.

2.Problem based assignment on each unit

Recommendation

As far as possible, preference should be given to prepare drawing sheets using computer.

Recommended Books :

1) Shigley J.E. and Mischke C.R., "Mechanical Engineering Design" McGraw Hill Pub. Co. Ltd.
2) Spott's M.F. and Shoup T.E., "Design of Machine elements", Prentice Hall International.
3) Bhandari V.B., "Design of machine elements", Tata McGraw Hill Public Co. Ltd.
4) Black P.H. and O. Eugene Adams, "Machine Design", McGraw Hill Book Co. Ltd.
5) Willium C. Orthwine, "Machine Components Design", West-Pub. Co. an Jaico Pub. House.
6) "Design Data", P.S.G. College of Technology, Coimbatore.
7) Juvinal R.C., "Fundamentals of Machine Components Design", John Wiely and Sons.
8) Hall A.S., Holowenko A.R. and Laughlin H.G., "Theory and Problems of Machine Design", Schaum's Outline Series.
9) P. Kannaiah , "Machine Design", Scitech Publication

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (MECHANICAL)
W.E.F.: 2007-08
TERM-II
TURBO MACHINERY

Teaching Scheme
Lectures: 4 Hrs/ week.
Practical: 2Hrs/week.

Examination Scheme
Paper: 3 Hours
Paper: 100 Marks
Oral: 25 Marks
Term Work:25 Marks

Unit-I **(10 Hours)**

STEAM TURBINES : Types of turbines, constructional details impulse turbine, compounding of turbine, velocity diagrams, output efficiency, losses in turbines, reaction turbine, velocity, diagrams, degree of reaction, constructional features of blades.

Governing of turbines, application of turbines, types of seals, and packing to reduce leakage, losses in turbines. **(20 marks)**

Unit-II **(10 Hours)**

GAS TURBINE : Theory and fundamentals of gas turbines, principles, classification, Joule's cycles, assumptions for simple gas turbines, cycle analysis, work ratio, concept of maximum and optimum pressure ratio, actual cycle, effect of operating variable on thermal efficiency, regeneration, intercooling, reheating, their effects on performance, closed cycle and semiclosed cycles gas turbine plant, applications of gas turbines.

(20 marks)

Unit-III **(10 Hours)**

JET PROPULSION:- Introduction, theory of jet propulsion, types of jet engines, energy flow through jet engines, thrust, thrust power, and propulsive efficiency, turbo jet, turbo prop, turbo fan engines, pulse jet and ram jet engines, performance characteristics of these engines, thrust segmentation application of jet engines, concept of rocket propulsion.

ROTARY COMPRESSOR :-

Concepts of rotary compressors, root blower and vane type compressors, centrifugal compressors, velocity diagram and expression for work done, introduction to terms like slip factor, power input factor.

(20 marks)

Unit-IV **(10 Hours)**

HYDRAULIC TURBINES :

Impulse momentum principle, fixed and moving flat plate and curve vanes, series of plates & vanes, velocity triangles and their analysis, work done, efficiency etc. classification of hydraulic turbines, Heads & various efficiencies,

Impulse turbine : Main components and constructional features of pelton wheel, velocity diagrams & work done, condition for max. hyd. Efficiency, number of buckets, jets, Non dimensional parameters (speed ratio, jet ratio).

(20 marks)

Unit-V **(10 Hours)**

HYDRAULIC TURBINES (REACTION TYPE)

Reaction turbine, main components & constructional features, types of reaction turbine (Francis, Kaplan), draft tube types, efficiency, cavitations, governing mechanisms for pelton wheel, Francis, Kaplan turbines, Types of characteristic curves, unit quantities, selection of turbine considering various factors, specific speed, Application of similarity as applied to turbines, scale effect.

(20 marks)

Any **Eight** Experiments based on the following list:

1) Study of steam turbine power plant.
2) Study of steam turbine systems.
    a) Methods of compounding
    b) Methods of governing
    c) Losses in steam turbine
    d) Lubrication system.
3) Trial on steam turbine.
4) Study of gas turbines.
5) Study of hydraulic turbines.
6) Trial on pelton wheel.
7) Trial on Francis turbine.
8) Trial on Kaplan turbine.
9) Trial on gas turbine plant.
10) Trial on centrifugal / rotary flow air compressor.
11) Study of various jet propulsion devices / engine.
12) Visit to hydraulic power plant.

Note : Oral will be based on the prescribed term-work presented in the form of certified journal.

Recommended Books :

1) Domkundwar, “Thermal Engineering”, Dhanpat Rai and Co Ltd. Delhi
2) P L Ballaney , “Thermal Engineering”. Khanna Publications, Delhi.
3) R K Rajput , “Thermal Engineering”, Laxmi Publication ltd. New Delhi.
4) Dr. R. K. Bansal, “Fluid Mechanics and Hydraulic M/c”, Laxmi publication Ltd. New Delhi.
5) Dr. Jagdish Lal, “Hydraulic Machine”. Metro politan book co. pvt Ltd. Delhi
6) Dr Modi seth, “Hydraulics & Fluid Machine”. Standard book house Delhi.

7) R. Yadav "Steam & Gas turbine", Central Publications, Allahbad.
8) J. K. Jain "Gas Turbine Theory & Jet Populsion", Khanna Publications, New Delhi.
9) Cohen, Roger "Gas Turbine theory", Longman Publications.
10) Gopalkrishnan "A Treatise on Turbomachines", Scitech Pub. (India)pvt.Ltd,Chennai
11) Kadambi V. & Prasrd M, "Turbo Machinery", New Age International Publication New Delhi.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (MECHANICAL)
W.E.F.: 2007-08
TERM-II
MECHANICAL MEASUREMENT AND METROLOGY
(Common with Automobile Engineering and Production Engineering)

Teaching Scheme	Examination Scheme
Lectures: 4 Hrs/ week.	Paper: 3 Hours
Practical: 2Hrs/week.	Paper: 100 Marks
	Oral: 25 Marks
	Term Work:25 Marks

Unit-I **(10 Hours)**

Fundamental of instrumentation, Block diagram of measuring instruments, Static and dynamic characteristics, Errors and source of error, Sensors and Transducers.

Signal transmission and processing:Intermediate Modifying devices-Mechanical, electrical & electronics,Terminating devices- Meter indicators, Mechanical Counters, CRO, XY plotters, oscillograph,

Data acquisition system: Introduction, Digital recording system,microprocessor based system **(20 Marks)**

Unit-II **(10 Hours)**

Measurement of force and torque: Introduction, Different type of load cells, dynamometers- Mechanical, electrical, hydraulic.

Pressure and flow measurement: Bourdon tube, diaphragm and bellows, vacuum measurement – McLeod gauge, thermal, conductivity gauge, Dead weight gauge tester, Electromagnetic flow meter, Ultrasonic flow meter, rotameter

Strain measurement: Types of strain gauge & their working, strain gauge circuits, Temperature compensation, Strain rosettes, Temperature measurement by electrical effects, RTD, Pyrometer. **(20 Marks)**

Unit-III **(10 Hours)**

Metrology Introduction: Definition and concept of metrology, standards of measurements. Classification of methods of measurement, precision and accuracy

Linear Measurement: Line standard and end standard, Wavelength standard, Slip gauges,

Measurement of geometric features, Machine tool metrology, Design and manufacture of gauges.

Comparators: Types, construction and working of different Mechanical, Optical, Electrical, Pneumatic comparators, Interferometry: Basic principles, Source of light, Optical flats, Fringe pattern and their interpolation.

(20 Marks)

Unit-IV **(10 Hours)**

Angular Measurement Angle standard, Sine bars, Sine centers, Angle gauges, autocollimator, angle Dekker, optical square, taper measurement, Universal bevel protractor,

Measurement of surface finish Surface texture, assessment of surface roughness as per IS, Tomlinson surface meter, and other surface measuring devices

Screw thread measurement: Terminology, errors in thread, Measurement of elements of external & internal threads,

Gear metrology: Gear terminology, measurement of element of gears

Toolmakers microscope, Profile projector. **(20 Marks)**

Unit-V **(10 Hours)**

Measuring Machines

UMM, CMM, Numerically controlled CMM, Fluidic system NC system, Recent trends in Engineering Metrology, Development in optical measurement, Precision instruments based on laser, Probes, telemetric system, Isometric viewing of surface defects, Nano technology

Quality control:

Introduction, Inspection, Sampling plans, Control charts. (X, R, C,P), Problems based on control charts, Recent trends in quality control (TQM,TQC,Six Sigma, Zero defect)

(20 Marks)

Any **Eight** Experiments based on the following list:

1) Determination of linear and angular dimension.
2) M/c tool alignment tests on any M/c tool like Lathe, Drilling m/c, Milling m/c
3) Measurement of surface finish and testing of surface flatness by optical flat
4) Study and measurement of parameter using tool makers microscope Use of comparator.
5) Measurement of screw parameter using floating carriage micrometer
6) Measurement by gear parameter- Gear tooth thickness, constant chord, pitch circle diameter
7) Measurement of temperature using thermocouple and pyrometer
8) Calibration of strain gauge meter
9) LVDT for displacement measurement
10) Flow measurement-using rotameter.

Recommended Books:

1) Beckwin Marrongoni and Lienhard , “Mechanical Measurement”, Pearson Educations
2) I.C.Gupta, “Engineering Metrology” , Dhanpat Rai & Sons
3) M.S.Mahajan, “Engineering Metrology”, Dhanpat Rai & Sons.

4) R.K.Jain, “Engineering Metrology”, Khanna Publications.
5) Doeblin, “Measurement System Application & Design”,McGraw Hill New Delhi.
6) D.S.Kumar, “Mechanical Measurement”,
7) A.K.Sawhaney, “ Mechanical Measurement and Instruments”, Dhanpat Rai and Sons
8) H.S.Kalsi, “ Electronic Instrumentation”, TMH
9) K.L.Narayanan, “Engineering Metrology”, Scitech Publication
10) R.S.Sirohi, H.S.Radhakrishnan, “Mechanical Measurement’’, New Age International

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (MECHANICAL)
W.E.F.: 2007-08
TERM-II
PROJECT AND BUSINESS MANAGEMENT

Teaching Scheme	Examination Scheme
Lectures: 4 Hrs/ week.	Paper: 3 Hours
Practical: 2Hrs/week.	Paper:100 Marks
	Term Work:25 Marks

Unit-I **(10 Hours)**

Introduction, Basic concept of project management, Types of projects, Project identification & Formulation scheduling, Monitoring, Control benefits, Basic tool & techniques for project scheduling, Calendar schedule, Bar chart, Project life cycle curves, Line & balance, Problems on Line balancing.

(20 Marks)

Unit-II **10 Hours)**

Net Work Models: Introduction to PERT and CPM , Fundamental concept and network models and construction of network diagrams . PERT activity , time cstimatcs,critical and project time duration. Optimization of project time and cost in PERT network.

(20 Marks)

Unit-III **(10 Hours)**

Forms Of Business Organization: Concept of Ownership Organization , Types of ownership, Individual Ownership, Partnership organization ,Distinction between individual ownership & Partnership ,joint stock companies ,types of stock companies ,comparison between private & public Ltd. Co's.,distinction between partnership and joint stock, Co-operative Organisations,varuios types of co-operative societies, distinction between co-operative & joint stock companies ,distinction between private sector and public sector ,Public sector organization, State ownership, public co-operation, choice of form of organization ,comparative evaluation of different forms of business ownership. **(20 Marks)**

Unit-IV **(10 Hours)**

Financial Management: Introduction, Definition of financial management, functions of financial management , Sources of Funds, Capital, classification of capital, working capital, need for working capital, assessment of working capital ,Factors affecting working capital, Capitalization ,Sources of finance (Shares, debentures, difference between preference shares and equity shares, loans from banks, trade credit public deposits financial institutions)

Cost and cost control : Elements of cost, direct cost, indirect cost, variable and fixed cost, cost control technique, marginal costing, break even analysis.

(20 Marks)

Unit-V **(10 Hours)**

Material & Purchase Management: Scope, advantages of material management, function of material management, objectives of scientific purchasing ,functions of purchase department, classification of functions, 5R's Of Buying ,Methods of buying, Centralized versus decentralized buying, buying procedure, organization structure

Inventory management : Objective, types of inventory, selective inventory technique(ABC,VED,SDE,GOLF), Inventory model (Economic lot size with fixed price, EOQ with quantity discount) **(20 Marks)**

TERM WORK : Any **FIVE** assignments based on each unit.

Recommended Books:

1) Chase, Aquilano," Production and Operation Management",7th Edition-McGraw Hill Publishing Co. New Delhi., 1995.
2) Chary," Theory And Problems in Production and Operations Management",2nd Reprint, Tata McGraw Hill Publishing Co. New Delhi., 1996.
3) Nair,N.G.,"Production & Operations Management",Tata McGraw Hill Publishing Co. New Delhi.,1997.
4) Phillips,Don.T.,Ravindran,A.& James Solberg,"Operations Research Principle & Practice",John Wiley & Sons,1986.
5) Chadra Presanna ," Fundamentals of Financial Management" Tata McGraw Hill New Delhi.,1994.
6) Kolter Philip,"Marketing Management",Prentice-hall of India,1988.
7) Vyuptakesh Sharan.,"Fundamental of Financial Management", Pearson Education
8) L.C.Jhamb ,"Production(Operation)Management", Everest publishing house .
9) S.M.Inamdar, "Cost and Management Acounting"
10) M.K.Khan &P.K.Jain,"Financial Management", Tata McGraw Hill Publishing Co. New Delhi.
11) J.P.Bose, S.Talukdar, "Business Management", New Central Agencies (P) Ltd.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (MECHANICAL)
W.E.F.: 2007-08
TERM-II
Practical Training/ Mini Project/ Special study

Teaching Scheme	Examination Scheme
Practical: 2Hrs/week.	Term Work: 25 Marks

- Every student has to undergo industrial / practical training for a minimum period of two weeks during summer vacations between (S.E Second Term) fourth and (T.E First Term)fifth term or during winter vacation between fifth and sixth term(T.E. First Term and Second Term).

- The industry in which practical training is taken should be a medium or large scale industry

- The paper bound report on training must be submitted by every student in the beginning of (T.E. Second Term) sixth term along with a certificate from the company where the student took training .

- The report on training should be a detailed one.

- Maximum number of students allowed to take training in accompany should be five. Every student should write the report separately.

- In case if a student is not able to undergo practical training , then such student should be asked to

  Prepare special study report on a recent topic from reported literature.

  or

  A mini project related to mechanical branch of engineering.

  1. A student must design the model for mini project.

  2. The model should be simulated using any of the standard simulation software available.

  3. Result verification for paper design an simulation should be carried out and discrepancies should be discussed.

  4. Assemble the model. Prepare bill of materials.

  5. Project report should be detail of work , carried out by student ,including layouts , models, bill of materials and relevant details.

- The practical training /special study / mini project shall carry a team work of 25 marks. Every student shall be required to present a seminar in the respective class in the presence of two teachers. These teachers (appointed by head of department in consultation with the principal) shall award marks based on the following.

(a) Report	10 marks
(b) Seminar presentation	10 marks
(c) Viva – voca at the time of seminar presentation	05 marks

Total	25 marks

Engineering & Technology Faculty
Equivalence Subject of TE Mechanical Engineering

Sr. No.	Old Subject	Sr. No	New Subject
1	Heat Transfer and Gas Dynamics	**1**	Heat Transfer and Mass Transfer
2	Engineering Metallurgy	**2**	Engineering Metallurgy
3	Machine Design-I	**3**	Machine Design-I
4	Industrial Engineering and Mgt.	**4**	Industrial Engineering of SE (Mech.) New
5	Numerical Analysis and Computational method	**5**	Numerical Analysis and Computational Method
6	Machine Design –II	**6**	Machine Design-II
7	Dynamics of Machinery –II	**7**	Theory of Machine-II
8	Metrology and Quality Control	**8**	Mechanical Measurement and Metrology
9	Manufacturing Technology	**9**	Manufacturing Engineering –II of SE (Mech.) New
10	Turbo Machinery	**10**	Turbo Machinery

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