

Faculty of Engineering & Technology

**NORTH MAHARASHTRA UNIVERSITY,
JALGAON (M.S.)**

**THIRD YEAR ENGINEERING
(T.E.)**

**(AUTOMOBILE ENGINEERING)
TERM-I & II**

W.E.F.: 2007-08

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

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

Examination Scheme
Paper: 3 Hours
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.

Generalised 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, Reynold 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, Logmean 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**(10 Hours)****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 based on 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 Examination:

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) M. Thirumalseshwar,"Fundamentals Of Heat And Mass Transfer" Pearson Education.
- 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) Gupta And Prakash," Engineering Heat Transfer" (1994, Nemchand And Bros., VIth Edition.
- 10) Chapman A.J., "Heat Transfer" (1989), , IVth Edition.
- 11) Yunus A. Cengel, "Heat Transfer –A Practical Approach" (Tata McGraw Hill)
- 12) P.Kothandaraman "Fundamentals Of Heat And Mass Transfer".
- 13) M. M. Rathore "Engineering Heat and Mass Transfer", 2nd Edition, Laxmi Publications, New Delhi.
- 14) R. Rudramoorthy, K. Mayilsomy, " Heat Transfer", Pearson Education.

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

Design of Machine Element

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

Examination Scheme
Paper: 4 Hours
Paper: 100 Marks
Oral: 25 Marks
Term Work: 25 Marks

Unit-I

(10 Hours)

Fundamental of Design:

Mechanical Engineering design, Aesthetic considerations in design, Ergonomic consideration in design, Man/Machine closed loop system, Standardizations, selection of material, mechanical properties of material, Limits, fits, tolerance, factor of safety, theories of failure.

(20 Marks)

Unit-II

(10 Hours)

Design against fluctuating load

Fluctuating stresses, S-N diagram for fatigue loading, endurance limit, endurance strength

Modifying factors, stress concentration, causes and remedies, notch sensitivity, design of finite and infinite life under reverse stresses, cumulative damage in fatigue failure, Soderberg & Goodman diagram, Modified Goodman diagram, fatigue design for component such as shaft, bolted joints & springs under combined stresses.

(20 Marks)

Unit-III

(10 Hours)

Design of shaft keys and coupling

shafts: Introduction, types of shafts, design of shafts subjected to twisting moments, bending moments, combined twisting and bending moments

Keys :Types of keys, design of keys,

Coupling : Design of rigid coupling & design of flexible coupling.

(20 Marks)

Unit-IV

(10 Hours)

a) Spur gear: Design of spur gear and helical gear, laws of gearing, terminology of spur Gear, force, analysis, face width, no. of teeth, beam strength and wear strength of gear, tooth, gear tooth failure

b) Helical gear: Terminology of helical gear, virtual no. of teeth, tooth properties, force analysis, beam strength and wear strength

c) Design of bevel: Terminology, force analysis, beam strength and wear strength.

(20 Marks)

Unit-V**(10 Hours)**Miscellaneous design

Design of power screw Self locking of power screws, recirculating ball screw

Design of springs : Types application, materials of springs-stress deflection equation of helical springs, Wahl's factor, Leaf Spring.

c) Design of Brakes.

(20 Marks)**Term work:**

1. Design project report of screw jack
2. Design project report of knuckle joint
3. Assignment on design of spring
4. Assignment on design of spur gear and helical gear
5. Assignment on shafts, keys, and coupling
6. Assignment on c programming of helical compression spring
7. Assignment on c programming of coupling
8. Auto lisp programme on knuckle joint

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. (AUTOMOBILE)
W.E.F.: 2007-08
TERM-I
CAD/CAM

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

Examination Scheme
Paper: 4 Hours
Paper: 100 Marks
Oral: 25 Marks
Term Work: 25 Marks

Unit-I **(10 Hours)**
Definition, concept, product life cycle & cad/cam, reasons for implementing cad systems,
Computer aided design process & various steps in it. Benefits of cad, integration of cad/cam, necessity, automation. Types of automation. Application of cad/cam. Wire frame Modeling, surface modeling & solid modeling. Introduction to rapid prototyping, Concurrent engineering. **(20 Marks)**

Unit-II **(10 Hours)**
INTERACTIVE COMPUTER GRAPHICS:
Definition, concepts, two dimensional transformations, scaling translation, rotation. Matrices representation & homogeneous coordinates. Composites Transformations, curves & surfaces .Parametric and non parametric representation Of curves and surfaces .Bazier curves, B-spline curves, bazier surface, B Spline surface. **(20 Marks)**

Unit-III **(10 Hours)**
FEM ANALYSIS AND ITS APPLICATION
Introduction, process of FEA physical models mathematical model & finite element solution. Finite element analysis as an integral part of cad.
Heat transfer analysis: Governing heat transfer equation, incremental equation, Incompressible in viscous flow, torsion. FEM analysis of rolling and extrusion process, 2-D analysis. **(20 Marks)**

Unit-IV **(10 Hours)**
FMS, GT (CAM) s
Components of computer integrated manufacturing system, Building blocks of flexible manufacturing system. FMS in job, batch and mass production. Machining systems of FMS. Tool management system. Workpiece handling systems. Flexible manufacturing cells. Means to achieve various types of flexibilities such as machine process, material handling, product, production flexibility
GROUP TECHNOLOGY
Models and algorithms, visual methods, coding methods, clusters analysis method, matrix formulation, mathematical programming formulation

Concept of cellular manufacturing, types of cell manual and robotized, method of cell formation, advantages of cellular manufacturing. **(20 Marks)**

Unit-V

(10 Hours)

ROBOTICS

Components, classification, selection, sensor technology, robot arm trajectory, arm dynamics Trajectory planning, robot grippers.

Robot kinematics: Object location, transformation (2D & 3D),direct &inverse kinematics, manipulators motion. mathematical model of servo system

REVERSE ENGG:

Basic steps in reverse Engg. such as data capture ,preprocessing, segmentation & surface fitting,3D CAD model creation, application of reverse engg.

(20 Marks)

Term Work (any seven)

- 1) Design of any of the sub systems of compressor condenser or evaporator in 'C' language
- 2) Design of any one of following: Piston, Cylinder, Connecting rod, Crankshaft, Valves etc. with help of 'C' language
- 3) Drafting of any one of following components-rotor and stater blades, casing, bearings etc with help of AUTOCAD .
- 4) Use of generative manufacturing process for rapid prototyping.
- 5) Use of software packages like Ideas, Pro-E E, Catia,Unigraphics , Surfcam,Master cam etc. for solid modeling of any of engg components
- 6) Reverse engg of any geometric model
- 7) Problems on FEM Gears etc by using CAD/CAM packages like idea, ansys etc.
- 8) Program for transformation –translations ,rotation, scaling .
- 9) Assignment on robot programming compulsory
- 10) Assignment on FMS,Group technology Compulsory

Note: Computer programming is restricted for practical Period only.

Oral will based on above term work only

Recommended Books :

- 1 M.P.Grover & E.W.Zimmer, "CAD/CAM", Prentice Hall of India Pvt.Ltd.
2. Krishnamurthy & Rajeev, "Computer Aided Design", Narora publication
- 3) Zeid, "CAD/CAM"-Theory and practice, Tata McGraw Hill, New Delhi.
- 4) V.B.Bhandari, Design of Machine Element. Tata McGraw Hill, New Delhi.
- 5) Radhakrishna & Subramanian, "CAD/CAM/CIM"
- 6) Chris McMohon and Simmie Browne, " CAD/CAM", Pearson Education.
- 7) Chris McMohon and Simmie Browne, " CAD/CAM Principal practice and Manufacturing Management", Pearson Education.

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

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 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, involute and cycloidal profile, path of contact, arc of contact, contact ratio, interference, undercutting, methods to avoid undercutting and interference, 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 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 McGraw Hill, New Delhi.
- 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 McGraw Hill New Delhi.
- 5) Ghosh, Malick, "Theory of Machines and Mechanisms".
- 6) Shigley, "Theory of Machines and Mechanisms", McGraw Hill International
- 7) Sadhu Singh, "Theory of Machine", Pearson Education
- 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. (AUTOMOBILE)
W.E.F.: 2007-08
TERM-I
INTERNAL COMBUSTION ENGINE
(Common with Mechanical Engineering)

Teaching Scheme
Lecture: 4 Hour/Week
Practical: 2 Hours/Week

Examination Scheme
Paper: 3 Hours
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 & Sons 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. (AUTOMOBILE)

W.E.F.: 2007-08

TERM-I

COMPUTER PROGRAMMING IN C / C++

(Common with Mechanical Engineering)

Teaching scheme
Practical: 2hrs/week

Examination Scheme
Term work: 25 marks

- 1) One assignment on introduction to computer
- 2) 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, New Delhi.
- 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" Tata McGraw Hill, New Delhi.
- 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, New Delhi.
- 7) Balgurusamy, "Object Oriented Programming with C++" Tata McGraw Hill, New Delhi .

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

Entrepreneurship Development Skill/ Human Research Training
(Common with Production Engineering and Mechanical 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. (AUTOMOBILE)
W.E.F.: 2007-08
TERM-II
ENGINEERING METALLURGY
(Common with Mechanical Engineering and Production Engineering)

Teaching Scheme

Lectures: 4 hrs. /week

Practical: 2 hrs. /week

Examination Scheme

Paper: 3 Hours

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 increase strength of steel, Isothermal transformation Diagram, Tempering of martensite, other heat treatment methods such as austempering, patenting, isoforming, martemperig, Ausforming, etc., continuous cooling Transformation, Jominey Test for Hardenability, Hardenability considerations, Quenching media, Techniques 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, Nitriding,

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

(18)

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. (AUTOMOBILE)
W.E.F.: 2007-08
TERM-II
Automobile Systems

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)**

Vehicle layouts and specification:-

Vehicle specification, vehicle layouts, types of vehicles and their applications, two and four wheelers, cars, Light commercial vehicles, Trucks, buses, earth moving machinery, highway vehicles, agricultural tractors, construction of automobile and various systems Of automobiles

Chassis and frames:

Frame, sub frame, integral construction, frame alignment, body bumpers, doors, hood, articulated vehicles, trailers and safety consideration.

(20 Marks)

Unit-II **(10 Hours)**

Battery

Introduction, Principles of battery operation, battery construction, recharging of battery, Battery rating, battery capacity and battery efficiency, checking specific gravity of battery, battery test, battery charging, battery failure, and battery troubles shooting,

(20 Marks)

Unit-III **(10 Hours)**

Ignition systems

Conventional Ignition systems: Function, types of Ignition systems, components, Battery Ignition systems, Magneto Ignition systems, Testing of Ignition circuits, Ignition systems trouble shooting.

Electronic Ignition systems

Introduction, principles of Electronic Ignition systems, pulse generator, distributor less ignition system.

Starting systems: Starting motors, starting devices, bendix drive, overrunning clutch drive, starting motor switch and control switch, starting system troubleshooting.

(20 Marks)

Unit-IV**(10 Hours)**Wheels, Tyres, and Tubes

Construction and types of wheels, wheel dimensions, types of tyres, tyre property , tyre material, consideration in trade design, wheels and tyre trouble shooting, retyring of tyres ,Tubes, Natural rubbers and butyl flops, Rims, types, and maintenance

Front axle and steering:

Introduction, front axle, factors of wheel alignment, steering geometry, steering mechanisms, cornering force, understeer and oversteer, steering linkages, steering gears, steering ratio, special steering columns, power steering, advanced steering systems.

(20 Marks)**Unit-V****(10 Hours)**Air conditioning systems

Definition of basic terms of psychometry such as DBT, WBT, RH, etc. Human comfort conditions, temperature control system, Insulation methods in auto air conditioner .Study of typical auto air conditioner , location of window air conditioner, study of typical air conditioner systems, various parts of systems, compressor performance and its effect on overall engine performance.

(20 Marks)**Term work:**

1. To study different vehicle layouts & their comparision
2. To study various battery testing &battery charging methods.
3. To study battery ignition & magneto ignition system
4. To study Electronics ignition & distributor less ignition system
5. To study bendix drives and overrunning clutch type starting motors
6. To study of power steering mechanism
7. Trial on wheel alignment and wheel balancing machine
8. To study automobile air conditioning system

Recommended Books:

- 1) Dr.Kripal Singh," Automobile Engineering" vol-I &II
- 2) R.B.Gupta,"Automobile Engineering"; Satya prakashan, New Delhi
- 3) Newton, steed and Garret, "Motor vehicle", Butterworth, London
- 4) Narang G.B.S, "Automobile Engineering", Khanna publication, New Delhi
- 5) A.W.Judge,"Modern Transmission" Chapmen and Hall std 1989
- 6)Nakara C.P., "Basic Automobile Engineering", Dhanpat Rai Publishing co.

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (AUTOMOBILE)
W.E.F.: 2007-08
TERM-II
Automobile Engines

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

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

Unit-I (10 Hours)

BASIC ENGINE COMPONENTS & THEIR NOMENCLATURE: Engine cylinder, cylinder head, cylinder block, cylinder liner, oil pan, inlet and exhaust manifold, gasket, piston for C.I. & S.I. engine, piston rings, piston pin, connecting rod, Crank shaft, main bearing, cam shaft, engine mounting, & engine balancing, Vibration damper, cam shaft, Inlet & Exhaust valves, valve actuating mechanism, Air cleaner, Silencer, Tail pipe, Spark plugs. Working principle of engine: Four stroke S.I. Engine, Four strokes C.I. Engine, Two stroke engine, comparison of two strokes & four stroke engines.

(20 Marks)

Unit-II (10 Hours)

FUELS FOR AUTOMOBILE ENGINES

Introduction, Desirable properties of good engine fuels, Requirement of fuel's for S.I.Engine, Requirement of fuel's for C.I.Engine, Rating for S.I. & C.I.Engine fuels. Alternative fuels, Alcohol for S.I.Engine, Alcohol for C.I.Engine, Hydrogen fuels, Compressed natural gas, Liquefied natural gas, Advantage and Disadvantage of LPG, LPG fuel feed system.

(20 Marks)

Unit-III (10 Hours)

Recent developments in Automobile Engines

Electronic engine controls- ECM, Operating module of ECM (closed loop & open loop) Inputs required & output signals from ECM, Electronic spark timing, DTSI, MPFI, CRDI, VVTI.

Automotive Sensors

Oxygen sensor, pressure sensor, Knock Sensor, Temperature Sensor,

(20 Marks)

Unit-IV (10 Hours)

NON CONVENTIONAL ENGINES

Dual fuel engines-Introduction, working principles, combustion in dual fuel engine.

Wankel engine-Working principle, Advantages and disadvantages

c) Stirling engine-Working principle, Advantages and disadvantages

d) Variable compression ratio engine, Advantages and disadvantages

(20 Marks)

Unit-V**(10 Hours)****ENGINE EMISSION AND CONTROL**

Introduction, S.I.Engine emission, C.I.Engine emission, formation of smoke & affecting factors, comparison of diesel & petrol emission, Infrared absorption gas analyzer for measuring co, Flame ionization, Detector for measuring HC emission

Chemiluminescences for measuring NO_x, Measurements of smoke, Hartidge smoke meter, Bosch smoke meter, smoke density meter.

Control: Control of emission for S.I.Engine, Modification in Engine design, Exhaust Gas treatment, Dual catalyst system, three way catalyst converter, sensor, and control of emission from diesel engine.

(20 Marks)**Term work:**

- 1) Experimental study of LPG Fuel feed system
- 2) Experimental study CNG Fuel feed system
- 3) Experimental study OF DTSI System
- 4) Experimental study OF CRDI System
- 5) Experimental study of pressure & temperature sensor
- 6) Experimental study of position & oxygen sensor
- 7) Experimental study of exhaust gas analyzer & smoke meter

Recommended Books:

- 1) Sharma R.P. & Mathur M.L., "Internal Combustion Engine ", Standard Publication, New Delhi.
- 2) Domkundwar, "I.C. Engine" Dhanpatrai & Co. New Delhi.
- 3) R.K. Rajput, "I.C.Engine", Laxmi Publications, New Delhi.
- 4) Crouse & Anglin, "Automotive Mechanics", Tata McGraw Hill, New Delhi.
- 5) E.F. Pulkrabek, "Fundamentals of Internal Combustion Engine", Prentice Hall of India (p) Ltd. New York
- 6) Ferguson C.R. , "Internal Combustion Engine" Wiley Inc. New York.

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

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)

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.

(25)

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

NORTH MAHARASHTRA UNIVERSITY, JALGAON
T.E. (AUTOMOBILE)
W.E.F.: 2007-08
TERM-II
Transport Management and Safety Regulation

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)**

Motor Vehicle Act-1989

Short Titles and definitions laws governing use of motor vehicle & vehicle transport , licensing of drivers and conductor, Registration of vehicle, state and interstate permits, taxation structure and methods of laving taxation, insurance type and significance, furnishing particulars of vehicles involved in accident, award of claim tribunal, duty of driver & conductor in case of accident, traffic rules , signals and controls, accidents causes and analysis ,liabilities and preventive measures, Design of road complex , Responsibility of driver , Public authorities, offences, penalties and procedures, Different types of forms, Government administration structure, personnel authorities and duties.

(20 Marks)

Unit-II **(10 Hours)**

A) Transport terminology –

Important terms used in road transport organization like HMV , LMV, Fleet utilization , breakdown rate, accident rate, route, seat km etc

B) Cost of Services-

Capital cost & operating cost, fixed cost & variable cost, direct & indirect cost, excess capacity and effect on route

C) Operational productivity and efficiency

Productivity in road transportation organization, the environment of road transport system, Optimizing fleet and vehicle utilization, conservation of fuel and economy, control of breakdown, effective traffic operation

(20 Marks)

Unit-III **(10 Hours)**

A) Infrastructure in road transportation organization

Garages, essential requirements of garages, fleet maintenance record , bus station , bus shelter, bus stop, essential requirement, staffing, management of transport organization and its of objectives, Typical depot layout structure of passages and goods transport organization

(27)

B) Motor industry

Manufacturing techniques and quality control of automobile components such as piston, cylinder, valves, crankshaft, camshaft, bearing. **(20 Marks)**

Unit-IV

(10 Hours)

Significance of Road Transportations

Road transportation as an agent of change and development ,National scene, transport policy and co-ordination, operating characteristics in transportation, engineering flexibility ,speed and acceleration, dependability and safety performance criteria

B) Transport planning:

Strategic planning, management control, operational control **(20 Marks)**

Unit-V

(10 Hours)

Road safety and Health

Driving comfort, avoiding fatigue, the road to exhaustion, poisonous car fumes, car sickness, drugs & driving first aid for motorist, first aid kits, braking & stopping interpreting the signs ,rain,floods,hot,mistcare &precaution , ice snow skidding, emergencies&road observations,

Accidents:-Definition of accident, legal obligation , causes of accident,Insurance,Documantation,Analysis & preventions of accidents, Road Safety & Drivers Role , a defensive driver, driver selection test, Drivers training;

Security Devices:-Dog Restraint, Rear fog lamp, guard lamp, reversing light,bonet,brakes locks,vibrator alarm, fog lamp, Toe bar,Rouf racks, Luggage containers. **(20 Marks)**

Term work:

- 1 Collection and study of different types of R.T.O. forms.
- 2 Collection and study of goods transport records.
- 3 Study of accident claim and survey report.
- 4 Study of depot layout (passenger & goods transport)
- 5 Study of vehicle manufacturing company layout.

Recommended Books :

- 1) P.G.Patankar, "Road passenger Transport in India", C.I.T.T. Publication
- 2)Santosh Sharma, "Productivity In Road Transportation"- A.S.R.T.V.Publication
- 3) Motor Vehicle Act 1989.
- 4) Compendum of Transport Terms- C.I.R.T.Pune

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

Practical Training/ Mini Project/ Special study

Teaching Scheme:
Practical: 2Hrs/week.

Examination Scheme:
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 automobile branch of engineering.
 - i. A student must design the model for mini project.
 - ii. The model should be simulated using any of the standard simulation software available.
 - iii. Result verification for paper design an simulation should be carried out and discrepancies should be discussed.
 - iv. Assemble the model. Prepare bill of materials.
 - v. 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
	i. -----
Total	25 marks

(30)

Engineering & Technology Faculty

Equivalence Subject of TE Automobile Engineering

Sr. No.	Old Subject	Sr. No	New Subject
1	Engineering Metallurgy	1	Engineering Metallurgy
2	CAD/CAM	2	Computer Aided Design and Computer aided Manufacturing
3	Industrial Engg. & Management	3	Industrial Engg. Of SE (Auto.) New
4	Heat Transfer & Mass Transfer	4	Heat Transfer & Mass Transfer
5	Machine Design-I	5	Design of Machine Elements
6	Dynamic of Machinery –II	6	Theory of Machine –II
7	Manufacturing Technology	7	Manufacturing Technology-II of SE (Auto) New
8	Hydraulic and Pneumatic	8	Industrial Hydraulic and Pneumatic of TE (Production) New
9	Metrology & Quality Control	9	Mechanical Measurement & Metrology
10	Automobile System	10	Automobile System

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