

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT - MACHINE DESIGN-II
CODE - BE610

UNIT I Springs

Spring materials and their mechanical properties, equation for stress and deflection, helical coil springs of circular section for tension, compression and torsion, dynamic loading, fatigue loading, Wahl line, leaf spring and laminated spring.

UNIT II Spur Gears

Tooth forms, System of gear teeth, contact ratio, Standard proportions of gear systems, Interference in involute gears, Backlash, Selection of gear materials, Gear manufacturing methods, Design considerations, Beam strength of gear tooth, Dynamic tooth load, Wear strength of gear tooth, Failure of gear tooth, Design of spur gears, AGMA and Indian standards.

Helical Gears

Terminology, Proportions for helical gears, Beam strength and wear strength of helical gears, herringbone gears, crossed helical gears, Design of helical gears.

UNIT III

Bevel gears

Types of bevel, Terminology, Gear tooth proportions, Efficiency of bevel gears, Heat dissipation in bevel gearing, Strength and wear tooth load for bevel gears, Design of bevel gearing

Worm Gears

Types of worms, Terminology, Gear tooth proportions, Efficiency of worm gears, Heat dissipation in worm gearing, Strength and wear tooth load for worm gears, Design of worm gearing

UNIT IV

Sliding Contact Bearing

Types, Selection of bearing, Plain journal bearing, Hydrodynamic lubrication, Properties and materials, Lubricants and lubrication, Hydrodynamic journal bearing, Heat generation, Design of journal bearing, Thrust bearing-pivot and collar bearing, Hydrodynamic thrust bearing,

Rolling Contact Bearing

Advantages and disadvantages, Types of ball bearing, Thrust ball bearing, Types of roller bearing, Selection of radial ball bearing, Bearing life, Selection of roller bearings, Dynamic equivalent load for roller contact bearing under constant and variable loading, Reliability of Bearing, Selection of rolling contact bearing, Lubrication of ball and roller bearing, Mounting of bearing.

UNIT V

Clutches and Brake

Friction clutches, Friction materials, Torque transmitting capacity, Single & Multiple plate clutch, centrifugal clutches. Design of brake, Shoe brake, Band Brake , Internal Expanding Brake.

Books and References:

1. Mechanical Engineering Design – Joseph E. Shigely, McGraw Hill Publications
2. Design of Machine Memebbers-Alex Valance and VI Doughtie, McGraw Hill Co.
3. Design Data book- P S Gill
4. Design Data Book – B D Shivalkar
5. Machine design -Black & Adams, McGraw Hill
6. Machine Design-Sharma and Agrawal, S.K. Katara& Sons
7. Design of Machine Elements-V.B. Bhandari, Tata McGraw Hill Co.

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT - MACHINE TOOL TECHNOLOGY
CODE - BT611

UNIT - I

Cutting Tool – types, requirements, specification & application

Geometry of Single Point Cutting Tool - tool angle, Tool angle specification system, ASA, ORS and NRS and inter-relationship.

Mechanics of Metal Cutting

Theories of metal cutting, Chip formation, types of chips, chip breakers, Orthogonal and Oblique cutting, stress and strain in the chip, velocity relations, power and energy requirement in metal cutting.

UNIT - II

Machinability

Concept and evaluation of Machinability, Mechanism of Tool failure, Tool wear mechanism, Tool life, Tool life equation, Machinability index, factors affecting machinability.

Thermal Aspects in Machining and Cutting Fluid

Source of heat in metal cutting and its distributions, temp measurement in metal cutting, function of cutting fluid, types of cutting fluid.

UNIT – III

Design of Machine Tool Element

Design of Lathe bed, Material and construction feature, various bed section, analysis of force under headstock, tailstock and saddle, torque analysis of lathe bed, bending of lathe bed, designing for torsional rigidity, use of reinforcing stiffener in lathe bed.

Design of Guide ways, Material and construction features, over turning diagram, Antifriction guide ways.

UNIT – IV

Design of Speed Gear Box

Drives in Machine Tool, classification, selecting maximum and minimum cutting speeds, speed loss, kinematic advantage of Geometric progression, kinematic diagrams, design of Gear Box of 6,9,12 and 18 speed.

UNIT – V

Design of Feed Gear Box

Elements of feed gear box, classification-Norton drive, draw key drive, Meander's drive, Design of feed gear box for longitudinal and cross feed and for thread cutting.

Machine Tool Installation and Maintenance

Machine Tool installation, Machine Tool Maintenance, lubrication, reconditioning of machine tool.

Machine Tool Testing

Testing, Geometrical checks, measuring equipment for testing, acceptance test for Lathe and Radial drilling machines.

TEXT BOOKS

1. Machine Tool Engineering – G.R. Nagpal – Khanna Publishers, New Delhi
2. Fundamentals of Metal Cutting & Machine Tool – B.L. Juneja, G.S. Sekhan, Nitin Sethi – New Age Publishers – New Delhi

REFERENCE BOOKS

1. Production Engineering – P. C. Sharma – S. Chand & Company – New Delhi
2. Production Technology – R.K. Jain – Khanna Publisher – New Delhi
3. Principle of Metal Cutting - G.C. Sen, A. Bhattacharya – New Central Book Agency (P) Ltd., Calcutta
4. Machine Tool Practices – Kibbe Richard R – PHI, New Delhi
5. Principles of Machine Tool – G.C. Sen, A. Bhattacharya – New Central Book Agency, Calcutta

MATS UNIVERSITY
SEMESTER – V
BRANCH – MECHANICAL
SUBJECT - INTERNAL COMBUSTION ENGINE
CODE - BT612

UNIT – I Air Standard Cycles: Internal and external combustion engines; classification of I.C. Engines, Cycles of operation in four stroke and two stroke I.C. Engines, Wankel Engines, Assumptions made in air standard cycle; Otto cycle; diesel cycle, dual combustion cycle, comparison of Otto, diesel and dual combustion cycles; sterling and Ericsson cycles; air standard efficiency, specific work output, specific weight; work ratio; mean effective pressure; deviation of actual engine cycle from ideal cycle. Problems.

UNIT – II Carburetion, fuel Injection and Ignition systems: Mixture requirements for various operating conditions in S.I. Engines; elementary carburetor, Requirements of a diesel injection system; types of inject systems; petrol injection, Requirements of ignition system; types of ignition systems ignition timing; spark plugs. Problems. performance against mixture strength.

UNIT – III Combustion in I.C. Engines : S.I. engines; Ignition limits; stages of combustion in S.I. Engines; Ignition lag; velocity of flame propagation; detonation; effects of engine variables on detonation; theories of detonation; octane rating of fuels; pre-ignition; S.I. engine combustion chambers, Stages of combustion in C.I. Engines; delay period; variables affecting delay period; knock in C.I. engines, Cetane rating; C.I. engine combustion chambers. performance of diesel engine .

UNIT – IV Lubrication and Cooling Systems: Functions of a lubricating system, Types of lubrication system; mist, wet sump and dry sump systems; properties of lubricating oil; SAE rating of lubricants, engine performance and lubrication, Necessity of engine cooling; disadvantages of overcooling; cooling systems; air-cooling, water cooling; radiators.

UNIT – V Engine Testing and Performance: Performance parameters: BHP, IHP, mechanical efficiency, brake mean effective pressure and indicative mean effective pressure, torque, volumetric efficiency; specific fuel consumption (BSFC, ISFC), thermal efficiency; heat balance; Basic engine measurements; fuel and air consumption, brake power, indicated power and friction power, heat lost to coolant and exhaust gases; performance curves. Problems. Air pollution from I.C. Engine and

Its remedies: Pollutants from S.I. and C.I. Engines, Methods of emission control; alternative fuels for I.C. Engines; the current scenario on the pollution front.

Text Books:

1. *Internal Combustion Engines –V. Ganesan, Pub.-Tata McGraw-Hill.*

2. *Gas Turbines – V. Ganesan, Pub.- Tata McGraw Hill.*

3. *Engineering fundamental of the I.C.Engine – Willard W. Pulkrabek Pub.-PHI,India*

Reference Books:

1. *Internal Combustion Engines & Air pollution- Obert E.F, Pub.-Hopper & Row Pub., New York*

2. *Internal Combustion Engines Fundamentals- John B. Heywood, Pub.-McGraw Hill, New York*

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT-INDUSTRIAL ENGINEERING& PRODUCTION MANAGEMENT
CODE-BT613

UNIT – I

Introduction

History & development, system approach, relationship with other departments. Objective of Industrial engineering, Place of Industrial engineering in an organization, related discipline, management, OR, statistics, ergonomics, manufacturing engineering.

Plant Location

Need for a suitable location, urban, suburban, systems approach, factors affecting location, quantitative method forevaluation of plant location.

Plant Layout

Objective & Principles, factors affecting layout, types of layout.

UNIT – II

Work Study

Purpose, objectives and applications of work study, Productivity and work study.

Method Study

Introduction, procedure, charts, man-machine, flow process charts, motion economy principles, micro motion study -Therbligs, cyclegraph.

Work Measurement

Definition, types, selection & timing the job, rating, allowances, Normal and standard time determination, worksampling

UNIT-III

Production Management

Definition, objectives, scope, benefits, functions of production management, place of production management in an organization, types of production system, Product life cycle, product design and development, production cycle.

Costing and Cost Analysis

Elements of costs, Break even analysis, Incremental costs, make or buy decision.

UNIT-IV

Sales Forecasting

Purposes, methods – Delphi, linear regression, economic indicators, time-series analysis, adjustment for seasonal variations, moving average, exponential smoothing.

Procurement

Objectives of purchase deptt.purchase responsibilities and organization, types of purchasing, purchase procedures, Import and Export.

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UNIT-V

Production Planning and Control

Functions, Organization, Master Scheduling, Aggregate planning and strategies ,Materials requirement planning, product structure tree, Routing, Loading Scheduling – forward and backward, Dispatching – priority rules, Sequencing, Johnson’s algorithm for n jobs and two machines, Gantt’s chart, Bar chart, Flow process chart.

TEXT BOOKS

1. Industrial Engineering & Management –A new perspective, Philip E Hicks, Mcgraw Hill
2. Industrial Engineering & Management – O.P. Khanna – DhanpatRai& Sons
3. Introduction of work study, ILO, Geneva. Universal Publishing Corporation, Bombay
4. Production and operation Management – By P. Ramamurty – New Age International Pub., 2005
5. Production and operation Management – By R. Mayer – TMH

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT - EXPERIMENTAL STRESS ANALYSIS
CODE - BT614

UNIT I

Two Dimensional Problems in Cartesian Coordinate system – Fundamentals of stress and strain, stress – strain relationship, Elastic constant, plane stress, plane strain, differential equation of equilibrium Boundary conditions, Saint Venant's principle, compatibility equation, Airys stress function. Stress analysis of cantilever subjected to concentrated load at its end and simply supported beam subjected to uniformly distributed load.

UNIT II ;

Two dimensional problem in polar coordinate systems – General equations of equilibrium in polar coordinate compatibility equation, stress distribution about symmetric, axis, stress analysis of cylinder subjected to ~ internal and external pressure, Pure bending of curved beams, effect of hole on the stress distribution in plates, Stress analysis of rotating circular disk.

UNIT III ;

Two Dimensional Photoelasticity – Introduction to basic optics related to photoelasticity, stress opticon law, plane and circular Polariscope arrangements, effect of stressed model in plane and circular polariscope, Isoclinic and Isochromatics, stress trajectories, calibration of photoelastic material (determination of fringe constant). Various photoelastic materials and their properties, Casting of photoelastic models, Tardy's compensation technique, Separation techniques like, shear difference, oblique incidence and electrical analogy.

UNIT IV :

Introduction to 3-D photoelasticity – Phenomenon of Stress freezing, Method of stress freezing, slicing techniques, determination of material fringe constant at critical temperature. Scaling Model – Prototype relations. Birefringent coating method – Reflection polariscope. Introduction to fringe sharpening and fringe multiplication.

UNIT V :

A. STRAIN GAGE

Strain gage technique for stress and strain analysis – Introduction to electrical resistance strain gages, gage, factor, bridge circuit, bridge balance, output voltage of Wheatstone bridge, balancing of bridge, temperature compensation, various bridge configurations, bonding of strain gages to the specimen, determination of principle strains and stresses using strain rosettes. Environmental effects on performance of strain gages, Strain gages response to dynamic strains, Effect of lead wires.

B. STRAIN MEASUREMENT

Introduction to Strain measurement on rotating components, Static and Dynamic Strain Measurement introduction to semiconductor gages, high temperature strain gages and self-

temperature compensated gages. Introduction to Commercial strain indicators. Grid technique of strain analysis, Brittle coating method for stress and strain analysis, Morie fringe method for stress and strain analysis.

Books :

1. Theory of Elasticity – S.P. Timoshenko
2. Experimental stress Analysis – Dally and Riley
3. Experimental Stress Analysis – T.K Ray
4. Experimental Stress Analysis – L.S. Srinath

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT –COMPOSITE MATERIAL
CODE - BT615(1)

UNIT I

Classification and characterization of composite materials; fibrous, laminated and particulate composites laminae and laminates; manufacture of laminated fibre – reinforced composite materials.

UNIT II

Macromechanicalbehaviour of laminar; stress-strain relations, engineering constraints for orthotropic materials stress-strain relations for lamina of arbitrary orientation. Strength and stiffness of an orthotropic lamina;

UNIT III

Bi-axial strength theories. Micromechanical behaviour of laminae; Rule of mixtures; Macromechanicalbehaviour of laminates

UNIT IV

Single layered configurations, symmetric laminates, and anti-symmetric laminates, known symmetric laminates; Strength of laminates; Interlaminar stresses

UNIT V

Design of laminates. Buckling and vibration of laminated beams, plates and shells.

Text Books

□ Composite materials: Design and application by Daniel Gay-et-al.

Reference Books

Mechanics of composite materials By Richard M Christensen

Introduction to composite materials design (Material Science &Engg.Series) By Barbero

Composite Manufacturing Material, Product and Process Engg. By Sanjay Majumdar

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT - CONTROL ENGINEERING
CODE -BT615(2)

UNIT I

Introduction to Control-Brief history and developments in Feedback control.

UNIT II

Modeling of physical systems- Mechanical, electrical, thermal and hydraulic systems. Concepts of state, state variable, state model. State models for linear continuous time functions, state space model formulation. Block diagram and signal flow graph analysis, transfer function.(Modern approaches such as Bond graphs may be used for modeling and control.)

UNIT III

System response- Time response of first and second-order systems, Steady-state errors and error constants. Performance specifications in time-domain. Effect of pole locations. Concept of stability, relative stability, Routh's stability criterion. Root locus method of analysis and design. Lead and lag compensation.

UNIT IV

Frequency-response analysis- Relationship between time & frequency response, Polar plots, Bode's plot, stability in frequency domain, Nyquist plots. Nyquist stability criterion. Performance specifications in frequency-domain. Frequency-domain methods of design. Compensation and their realization in time and frequency domains.

UNIT V

State variable Analysis- Solution of state equations. Concepts of controllability and observability. Pole placement design. Proportional, Integral and Derivative feedback. Simple case studies. (These may be supported using software such as MATLAB.)

Text/Reference Books:

1. Kuo, B. C., Automatic Control Systems, Prentice Hall.
2. Ogata, K., Modern Control Engineering, Prentice Hall
3. Franklin, G. F., Powell, J. D., Emami-Naeini, A., Feedback Control of Dynamic Systems, Pearson Education Inc.
4. Gopal. M., Control Systems Principles and Design, Tata McGraw-Hill.
5. EroniniUmez-Eronini, System Dynamics & Control, Brooks/ Cole Publishing Company.
6. Mukherjee.A, Karmakar.R and Samantaray.A.K, Bond Graph in Modeling, Simulation and Fault Identification, I. K. International Publishing House Pvt. Ltd.

7. Karnopp, Margolis, Rosenberg, System Dynamics Modeling and Simulation of Mechatronic Systems, Wiley
(Higher education).
8. Bernard Friedland, Control Systems Design, McGraw-Hill.

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT - MECHANICAL VIBRATION AND ACOUSTICS

CODE -BT615(3)

UNIT- I : Fundamentals of vibrations

Simple harmonic motion, combination of two simple harmonic motions, beats, Fourier analysis
Single degree of freedom system: Free un-damped vibrations: Equivalent systems linear and torsional, natural frequency estimation, energy methods Damped vibrations : Damping models, structural, coulomb, and viscous damping, critically, under and over-damped system, logarithmic decrement

Forced vibrations : Harmonic excitation, support motion, vibration isolation, critical speeds of shafts in bending

UNIT- II : Two degree of freedom system

Free vibrations of spring coupled system, general solution, torsional vibrations, two degree of freedom mass coupled system, bending vibrations in two degree of freedom system, forced vibrations of un-damped two degree of freedom system, dynamic vibration absorber, forced damped vibrations

UNIT- III : Multi-degree of freedom system Free un-damped analysis.

Numerical methods: Dunkerley's, Rayleigh, Holzer methods. Experimental methods in vibration analysis: Vibration measurement devices and analyzers, balancing of rigid rotors

UNIT- IV : Analysis and measurement of sound

One dimensional wave in a gas, sound perception and the decibel scale, the ear, combining sound levels in decibels, octave bands, loudness, weightings, directionality of acoustic sources and receivers, directivity index

UNIT- V : Noise control

Noise criteria, sound absorption and insulation, noise barriers, acoustic enclosures, silencers

TEXT BOOKS

1. Mechanical Vibrations –Thomson W T- Prentice Hill of India
2. Theory & Practice of Mechanical Vibrations – J.S. Rao, Gupta - New Age International.

REFERENCE BOOKS

1. Mechanical Vibrations and Noise Engineering – A G Ambekar – PHI, Delhi
2. Mechanical Vibrations – G.K. Grover - S. Chand & CO.
3. Acoustics for Engineers - Turner & Pretlove - Macmillan
4. Acoustics and Noise Control - Smith, Peters & Owen - Addison-Wesley-Longman

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT –MECHATRONICS

CODE -BT615(4)

UNIT I

MECHATRONICS, SENSORS AND TRANSDUCERS

Introduction to Mechatronics Systems – Measurement Systems – Control Systems
Microprocessor based Controllers. Sensors and Transducers – Performance Terminology –
Sensors for Displacement, Position and Proximity; Velocity, Motion, Force, Fluid Pressure, Liquid Flow, Liquid Level, Temperature, Light Sensors – Selection of Sensors

UNIT II

ACTUATION SYSTEMS

Pneumatic and Hydraulic Systems – Directional Control Valves –
Rotary Actuators. Mechanical Actuation Systems – Cams – Gear Trains – Ratchet and pawl –
Belt and Chain Drives – Bearings. Electrical Actuation Systems – Mechanical Switches –
Solid State Switches – Solenoids – Construction and working principle of DC and AC Motors
– speed control of AC and DC drives, Stepper Motors-switching circuitries for stepper motor –
AC & DC Servo motors

UNIT III

SYSTEM MODELS AND CONTROLLERS

Building blocks of Mechanical, Electrical, Fluid and Thermal Systems, Rotational –
Transnational Systems, Electromechanical Systems – Hydraulic –
Mechanical Systems. Continuous and discrete process Controllers – Control Mode – Two –
Step mode – Proportional Mode – Derivative Mode – Integral Mode – PID Controllers –
Digital Controllers – Velocity Control – Adaptive Control – Digital Logic Control –
MicroProcessors Control.

UNIT IV

PROGRAMMING LOGIC CONTROLLERS

Programmable Logic Controllers – Basic Structure – Input / Output Processing – Programming –
Mnemonics – Timers, Internal relays and counters – Shift Registers –
Master and Jump Controls – Data Handling – Analogs Input / Output – Selection of a PLC.

UNIT V

DESIGN OF MECHATRONICS SYSTEM

Stages in designing Mechatronics Systems – Traditional and Mechatronic Design -
Possible Design Solutions. Case studies of Mechatronics systems- Pick and place Robot-
Autonomous mobile robot-Wireless surveillance balloon- Engine Management system-
Automatic car park barrier.

TEXT BOOKS:

1. Bolton,W, “Mechatronics” , Pearson education, second edition, fifth Indian Reprint, 2003
2. Smaili.A and Mrad.F , "Mechatronics integrated technologies for intelligent machines", Oxforduniversity press, 2008

REFERENCES:

1. Rajput. R.K, A textbook of mechatronics, S. Chand & Co, 2007
2. Michael B. Hirst and David G. Alciatore, “ Introduction to Mechatronics and Measurement Systems”, McGraw-Hill International Editions, 2000.
3. Bradley D. A., Dawson D., Buru N.C. and. Loader A.J, “Mechatronics”, Chapman and Hall, 1993.
4. Dan Neculescu, “Mechatronics”, Pearson Education Asia, 2002 (Indian Reprint).
5. Lawrence J. Kamm, “Understanding Electro – Mechanical Engineering”, An Introduction to Mechatronics, Prentice – Hall of India Pvt., Ltd., 2000.
6. Nitaigour Premchand Mahadik, “Mechatronics”, Tata McGraw-Hill publishing Company Ltd, 2003

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT –INDUSTRIAL TRIBOLOGY

CODE - BT615(5)

UNIT- I

Introduction:

Tribology in design, tribology in industry Viscosity, flow of fluids, viscosity and its variation absolute and kinematic viscosity, temperature variation, viscosity index determination of viscosity, different viscometers, Tribological considerations Nature of surfaces and their contact; Physic mechanical properties of surface layer, Geometrical properties of surfaces, methods of studying surfaces; Study of contact of smoothly and rough surfaces.

UNIT- II

Friction and wear:

Role of friction and laws of static friction, causes of friction, theories of friction, Laws of rolling friction; Friction of metals and non-metals; Friction measurements. Definition of wear, mechanism of wear, types and measurement of wear, friction affecting wear, Theories of wear; Wear of metals and non-metals.

UNIT- III

Hydrostatic lubrication:

Principle of hydrostatic lubrication, General requirements of bearing materials, types of bearing materials., Hydrostatic step bearing, application to pivoted pad thrust bearing and other applications,

Hydrostatic lifts, hydrostatic squeeze films and its application to journal bearing, optimum design of hydrostatic step bearing.

UNIT- IV

Hydrodynamic theory of lubrication:

Principle of hydrodynamic lubrication, Various theories of lubrication, Petroff's equation, Reynold's equation in two dimensions -Effects of side leakage - Reynolds equation in three dimensions, Friction in sliding bearing, hydro dynamic theory applied to journal bearing, minimum oil film thickness, oil whip and whirl, anti –friction bearing, hydrodynamic thrust bearing.

UNIT- V

Air/gas lubricated bearing:

Advantages and disadvantages application to Hydrodynamic journal bearings, hydrodynamic thrust bearings. Hydrostatic thrust bearings. Hydrostatic bearing Analysis including compressibility effect.

Lubrication and lubricants:

Introduction, dry friction; Boundary lubrication; classic hydrodynamics, hydrostatic and elasto hydrodynamic lubrication, Functions of lubricants, Types of lubricants and their industrial uses; SAE classification, recycling, disposal of oils, properties of liquid and grease lubricants; lubricant additives, general properties and selection.

Text & Reference Books:

1. Fundamentals of Tribology, Basu, SenGupta and Ahuja/PHI
2. Tribology in Industry :Sushil Kumar Srivatsava, S. Chand &Co.
3. Tribology H.G.Phakatkar and R.R.GhorpadeNirali Publications
4. Tribology – B.C. Majumdar, McGraw Hill Co Ltd.
5. Standard Hand Book of Lubrication Engg., O'Conner and Royle, McGraw Hills C
6. Introduction to Tribology, Halling ,Wykeham Publications Ltd.

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT – MINOR PROJECT
CODE – BT616

Each student shall submit a minor project report and also present individual seminar on the project

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT- MACHINE DESIGN-II LAB
CODE-BT617

EXPERIMENTS TO BE PERFORMED:

Each student shall submit two-assembly design report along with the drawing for assembly/sub assembly for any mechanical system consisting of not less than four machine elements included in the syllabus.

LIST OF EXPERIMENTS TO BE PERFORMED (MINIMUM SIX EXPERIMENTS AND FOUR STUDIES)

1. Study of IC Engine models
2. Study of working of four stroke petrol engine and four stroke diesel engine with the help of cut section models.
3. Study of working of two stroke petrol and two stroke diesel engine with the help of cut section models.
4. Study of fuel supply system of a petrol engine (fuel pump and simple carburettor)
5. Study of complete carburettor (Solex carburettor)
6. Study of Petrol Injection System.
7. Study of fuel supply system of a Diesel engine (fuel pump and fuel injector)
8. Study of Ignition systems of an IC Engine (Battery and Magneto ignition system) and Electronic ignition system.
9. Study of Lubrication system of an IC Engine (mist, splash and pressure lubrication)
10. Study of cooling systems of an IC Engine (air cooling and water cooling)
11. To conduct a performance test on diesel engine to draw heat balance sheet for given load and speed
12. To determine friction power of diesel engine by Willan's line or fuel rate extrapolation method.
13. To conduct a performance test on the variable compression ratio engine and to draw the heat balance sheet for given compression ratio, speed and load and plot the performance curves.
14. To conduct a performance test on a four cylinder four stroke petrol engine and to draw the heat balance sheet and performance curves.
15. To calculate the indicated power, friction power and mechanical efficiency of four stroke four cylinder petrol engine at full load and rated speed by Morse test.
16. To draw the valve timing diagram of a Four stroke S.I. or C.I. Engine using experimental setup.
17. Analysis of engine exhaust gases using Orsat apparatus / gas analyzer.

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. Model Of Two & Four Stroke Petrol Engine
2. Model Of Two & Four Stroke Diesel Engine
3. Scooter Engine In Cut Section
4. Four Stroke, Four-Cylinder Petrol Engine In Cut Section
5. Carburettors In Cut Section / without cut section.
6. Model of Petrol Injection System
7. Bosch Fuel Pump In Cut Section
8. Nozzles In Cut Section
9. Diesel Injectors In Cut Section
10. Four Stroke Single-Cylinder Diesel Engine Test Rig
11. Variable Compression Ratio Engine Test Rig
12. Four Stroke Multi-Cylinder Petrol Engine Test Rig
13. Experimental setup for drawing valve timing diagram of Four stroke S.I. or C.I. engines.

14. Orsat apparatus / gas analyzer for engine exhaust gas analysis.

NON DESTRUCTIVE TESTING LAB

MATS UNIVERSITY

SEMESTER – VI

BRANCH – MECHANICAL

SUBJECT- NON DESTRUCTIVE TESTING LAB

CODE-BT619

1. To perform a visual inspection by Ringing test their effectiveness in detecting surface cracks, bond strength and surface defects.
2. To perform a visual inspection by chalk – test (oil-whiting test) their effectiveness in detecting surface cracks, bond strength and surface defects.
3. To study and perform a test by Dye – penetrant tests.
4. To study and perform a test by Zygo testing method.
5. To study and perform a test by Magnetic Particle Tests.
6. To study about DC And AC magnetization, and use.
7. To study about wet powders magnaglow testing.
8. To study about X-ray radiography.
9. To study about Gama-ray radiography.
10. To study about Piezoelectricity testing.
11. To study about cathode ray oscilloscope techniques.
12. To perform a test by NDT methods in inspection of castings structures.
13. .To perform a test by NDT methods in inspection of forgings structures.
14. To perform a test by NDT methods in inspection of welded structures.

Books and References:

1. Non destructive Testing Techniques by Ravi, Dean, Research & Consultancy Division and Birla Institute of Technology & Science (Jul 1, 2009)
2. handbook of Non destructive Evaluation by Charles Hellier (Mar 14, 2001)
3. Mahesh C. Bhardwaj, "*Non-Destructive* Evaluation.
4. Experimental and stress analysis by Dr. Sadhu singh.