



MATS UNIVERSITY

Raipur (C.G.)

Syllabus Scheme

(6th Semester)

For

Bachelor of Engineering

In

MECHANICAL



MATS School of Engineering & Technology

ARANG , RAIPUR (C.G.)



MATS UNIVERSITY

ARANG, RAIPUR



Subject Code For School of Engineering & Tech. Deptt.

6th Semester (MECHANICAL)

| S.No. | Subject Code | Subject Name |
|-------|--------------|------------------------------|
| 1 | BE610 | Machine Design -II |
| 2 | BE611 | Energy Conversion System |
| 3 | BE612 | Machine Tool Technology |
| 4 | BE613 | Industrial Engineering |
| 5 | BE614 | Turbo machinery |
| 6 | Refer Table | Elective - I |
| 7 | BE616 | Energy Conversion System Lab |
| 8 | BE617 | Non Destructive Testing Lab |
| 9 | BE618 | Industrial Engineering Lab |
| 10 | BE619 | Machine Design – II Lab |

Table – 1

Elective – I

| S.N. | Subject Code | Subject Name |
|------|--------------|------------------------------|
| 1 | BE6150 | Fluidics & Hydraulic Control |
| 2 | BE6151 | Automatic Control System |
| 3 | BE6152 | Tribology |
| 4 | BE6153 | Experimental Stress Analysis |
| 5 | BE6154 | Material Handling System |



MATS UNIVERSITY

ARANG, RAIPUR



Scheme of Teaching & Examination B.E. VI SEMESTER MECHANICAL ENGINEERING

| S.N. | code | Subject | Periods per week | | | Scheme of marks | | Total Marks |
|-------|--------------------|--------------------------------------|------------------|---|----|-----------------|-----|-------------|
| | | | L | T | P | ESE | IM | |
| 1. | BE610 | Machine Design -II | 4 | 1 | - | 70 | 30 | 100 |
| 2. | BE611 | Energy Conversion System | 4 | 1 | - | 70 | 30 | 100 |
| 3. | BE612 | Machine Tool Technology | 4 | 1 | - | 70 | 30 | 100 |
| 4. | BE613 | Industrial Engineering | 4 | 1 | - | 70 | 30 | 100 |
| 5. | BE614 | Turbo machinery | 4 | 1 | - | 70 | 30 | 100 |
| 6. | Refer Table | Elective - I | 4 | 1 | - | 70 | 30 | 100 |
| 7. | BE616 | Energy Conversion System Lab | - | | 3 | 20 | 30 | 50 |
| 8. | BE617 | Entrepreneur Development Program Lab | - | | 3 | 20 | 30 | 50 |
| 9. | BE618 | Industrial Engineering Lab | - | | 3 | 20 | 30 | 50 |
| 10. | BE619 | Machine design – II Lab | - | | 3 | 20 | 30 | 50 |
| Total | | | 24 | 6 | 12 | 500 | 300 | 800 |

L – Lecture, T – Tutorial, ESE – End Semester Examination,
P – Practical, IM – Internal Marks (Include Class Test & Teacher’s Assessments)

**Table - 1
Elective - I**

| S.N. | Subject Code | Subject |
|------|--------------|------------------------------|
| 1 | BE6150 | Fluidics & Hydraulic Control |
| 2 | BE6151 | Automatic Control System |
| 3 | BE6152 | Tribology |
| 4 | BE6153 | Experimental stress Analysis |
| 5 | BE6154 | Material Handling System |

Note (1) – $\frac{1}{4}$ of total strength of students subject to minimum of twenty students is required to offer an elective in the college in a particular academic session

Note (2) – Choice of elective course once made for an examination cannot be changed in future examinations.

**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 Members-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, Mc Graw 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 - ENERGY CONVERSION SYSTEM
CODE-BE611

UNIT – I Propulsion Devices

Types of jet engines, Ram Jet, pulse jet, Turbojet, Turbo propulsion, principle and operation. Energy flow through jet and variation of pressure and temperature, thrust equation, specific thrust and velocity of fluid. Thermodynamics of turbojet, efficiency & performance, parameters affecting performance, after burn, Injection of water & alcohol mixture. Various fuels used in jets.

UNIT – II
Rocket Propulsion

Basic theory, Physics equations, classifications, types of rocket engines, liquid propellant rockets, efficiency and performance, orbital & escape velocity application of space flight. Various fuels used in rockets, cryogenic rockets.

UNIT – III Non-Conventional Energy Conversion

Classical sources of energy crisis and search for alternative sources of energy. Solar energy, earth sun angles, resolution, solar measurement, collection of solar energy, flat plate and focusing collector analysis, calculations and same design parameters. Applications of solar energy. Introduction to Photovoltaic cell energy conversion techniques. Derivation for collector efficiency for flat plate collector.

UNIT – IV Bio-Mass & Wind Energy

Gasifiers, Gobar Gas plant, types of applications, Biomass conversion technologies, biogas Generation. Basic principles of wind energy conversion, wind energy estimation, site selection consideration, basic components of wind energy conversion system, classification, advantages & disadvantages of WECS.

UNIT – V Improved Energy Utilization & New Alternatives

Fuels cell technology, wave energy conversion, tidal energy conversion, OTEC. Principle of MHD power system, types of MHD system, advantages, materials for MHD system. Geothermal energy, nature of geothermal fields, Geothermal sources, prime movers for geothermal energy, advantages, disadvantages of Geothermal energy over other energy forms, its application. High pressure boiler Modification in Boiler, High Pressure Steam generators – La-Mont, Benson, Velox and Schmidt Hartmann Boilers. application of hydrogen as a fuel – a substitute as energy alternatives.

TEXT BOOKS

1. Fundamentals of Compressible Flow with Aircraft and Rocket Propulsion – S.M. Yahya – New Age International Publishers
2. Gas Dynamics & Space Propulsion – N. Shanmugam, M. Palani – Anuradha Agencies
3. Non-Conventional Energy Sources - G.D. Rai – Khanna Publishers

REFERENCE BOOKS

1. Fundamental of Compressible Fluid Dynamics – P. Balachandran – PHI
2. Gas Turbine Theory & Jet Propulsion – J.K. Jain – Khanna Publishers
3. Solar Energy – Garg & Prakash – TMH Pub.
4. Non Conventional Energy Sources – D.S. Chauhan – New Age International Pub.
5. Solar Energy, R Sukhatme,

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT - MACHINE TOOL TECHNOLOGY
CODE - BE612

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, tail stock 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 – VI
BRANCH – MECHANICAL
SUBJECT - INDUSTRIAL ENGINEERING
CODE - BE613

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 for evaluation 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, work sampling

UNIT -III

Job Evaluation & Merit Rating

Definition, objectives, methods, job rotation, job enlargement, job enrichment.

Wages & Incentives

Terminology, characteristics, factors, types of incentives, wage incentive plan, Rowan plan, Taylor's differential piece rate system, Emerson's efficiency plan, Halsey's 50-50 plan, Bedaux plan, Group task & Bonus system.

UNIT – IV

Information systems in organizations

Role of IS in Industry, increasing value of Information Technology, Internet worked enterprise, Internet, Intranet and Extranet, Globalization and IT, competitive advantage with IT.

Business Process Re-Engineering

Definition, need & characteristics, Industrial Engineering & Re-engineering, advantages of re-engineering.

UNIT V

Maintenance Management

Objectives and need for maintenance, types of maintenance, breakdown, predictive and preventive maintenance

Equipment replacement policy

Reasons for replacement, deterioration, obsolescence, depreciation, method for depreciation calculation

Value Engineering & Value Analysis

Objectives & scope, application & techniques.

TEXT BOOKS

1. Industrial Engineering & Management –A new perspective, Philip E Hicks, Mcgraw Hill
2. Industrial Engineering & Management – O.P. Khanna – Dhanpat Rai & Sons
3. Introduction of work study, ILO, Geneva. Universal Publishing Corporation, Bombay

REFERENCE BOOKS

1. Industrial Engineering and Production Management – Martand Telsan – S. Chand & Company
2. Motion & Time Study – Mundel - PHI
4. Motion and Time Study – Ralph M. Bannes – John Wiley & Sons
5. Techniques of Value Engineering – L.D. Miles – Mc GrawHill
6. Work Study and Ergonomics – H.S. Shan – Dhanpat Rai & Sons
7. Industrial Engineering & Management – S. Dalele & Mansoor Ali – Standard Publishers & Distributors
8. Handbook of Industrial Engineering – Grant & Grant – PHI

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT - TURBOMACHINERY
CODE - BE614

UNIT – I

Impulse Turbine

Steam turbine – Principal of operation of steam turbine, types, impulse turbine compounding of steam turbine pressure

compounded velocity compounded and pressure – velocity compounded impulse turbine.

Velocity diagram for impulse turbine, force on the blade and work done. Blade or diagram efficiency, gross stage

efficiency. Influence of ratio of blade to steam speed on blade efficiency in a single stage impulse turbine.

Efficiency of multi-stage turbine.

Impulse blade sections, choice of blade angle. Blade height in velocity compounded impulse turbine.

UNIT – II

Impulse Reaction Turbine

Velocity diagram, degree of reaction, impulse-reaction turbine with similar blade section and half degree of reaction. (Parson's turbine) Height of reaction turbine blading section internal losses in

steam turbine Nozzle, Losses, blade friction losses, disc friction losses, blade windage losses or partial admission losses, gland leakage or clearance losses, leaving velocity or residual loss, carry loss.

UNIT – III

State Point Locus and Reheat Factor

Factor-Stage, efficiency of impulse turbines, stage point locus of an impulse turbine, state point locus for multistage turbine reheat factor. Internal efficiency, over all efficiency, relative efficiency,

Governing of steam turbine.

Throttle governing, nozzle governing, bypass governing, combination of throttle and nozzle, governing and combination of bypass and throttle governing. Effect of governing on the performance of steam turbine.

UNIT – IV

Gas Turbine

Classification of gas turbine. Simple open cycle gas turbine Ideal and actual cycle (Brayton Cycle) for gas turbine. Optimum pressure ratio for maximum specific output in actual gas turbine Regeneration, reheat and inter cooling and effect of these modification on efficiency and output, closed cycle gas turbine.

UNIT – V

Centrifugal Compressors

Principle of operation, work done and pressure rise, velocity diagram for centrifugal compressor, slip factor, stage factor, stage pressure rise, loading coefficient, diffuser, degree of reaction, effect of impeller blade profile, pre-whirl and inlet guide vanes, centrifugal compressor characteristic curves..

Axial Flow Compressor-

Principle of operation and working, energy transfer, velocity diagram for axial compressor, factors affecting stage pressure ratio, blockage in compressor annulus, degree of reaction, 3-D flow, design process, blade design, calculation of stage performance, axial compressor performance characteristic curves.

TEXT BOOKS

1. Steam and Gas turbine – By R. Yadav - Central Publishing House, Allahabad
2. Design of high efficiency turbo machinery and gas turbines, David Gordon Wilson, Theodosios Korakianitis, Prentice Hall International.
3. Turbine compressors and Fans – S.M. Yahya – TMH
4. Gas Turbine – V. Ganeshan – TMH

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT- FLUIDICS & HYDRAULIC CONTROL
CODE-BE6150

UNIT-I
Fluidics

Technology, Terminology, types of fluid logic elements, amplifiers, logic states, methods of obtaining input signals and power outputs, application of fluidics, third generation fluidics.

UNIT – II
Fluid Power System

Components, advantages, applications in the field of Machine Tools, material handling, presses, mobile and stationary machines, clamping & indexing devices etc., transmission of power at static and dynamic states.

Hydraulic Fluid

Types of hydraulic fluids, properties of fluid, selection of fluids, JIC/ISO symbols for hydraulic circuits.

UNIT – III
Pumps

Types, classification, principle and working of vane, gear, radial and axial plunger pumps, power and efficiency calculations, selection of pumps for hydraulic transmission.

Actuators

Linear and rotary actuators, hydraulic motor types & construction methods of control of acceleration, types of cylinder and mountings, calculation of piston velocity, thrust under static and dynamic application.

UNIT – IV
Control of Fluid Power

Principle, working types of the following valves, pressure control, direction control, flow control, relief valves, sequence valves etc.

UNIT – V
Hydraulic Circuits

- Meter in, meter out circuits
- Pressure control for cylinders
- Flow divider circuits

Circuit illustrating use of pressure reducer valves, sequence valve, counter balance valves, unloading valves with the use of electrical control, accumulators etc.

Accumulators and Intensifiers:

Types, function, application, selection and design procedure.

TEXT BOOKS

1. Hydraulic Machines including fluidics – Dr. Jagdish Lal, Metropolitan Book Company pvt. Ltd., New Delhi
2. Introduction to Fluid Power – Sahastrabadhe – Nirali Prakashan, Pune

REFERENCE BOOKS

1. Industrial Hydraulics – Pipenger & Hicks, Mc Graw Hill Company, New York
2. Fluid Power – Goodwin

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT - AUTOMATIC CONTROL SYSTEM
CODE - BE6151

UNIT-I

Mathematical Modeling of Physical System and Concept of Transfer Function Representation Through Block Diagram and Signal Flow Graph. Transfer function Block Diagram Simplification and Mason's Gain Formula.

UNIT- II

Control System Components such as hydraulic actuators, Servomechanism liquid level control, Automobile Power Steering Control, Speed Control, Position Robotic Manipulator Etc.

UNIT- III

Time Domain Response Analysis under transient input steady state error error constants, PID controller and its application Routh criterion of stability.

UNIT- IV

Frequency Domain analysis Root - Locus techniques, Bode plot, gain Margin phase margin, transportation lag, System Identification from Bode plot.

UNIT- V

Polar Plot, Nyquist Plot and Stability criterion, Introduction to control system load compensation, Feed Back, Compensation and Pole -Zero placement. State Variable approach and state equations, Transfer function from state state transition matrix and solution of state equations controllability and observability through test model.

BOOKS :

- 1) Modern Control Engineering by Ogata [PHI]
- 2) Control system Engineering by Nise [Willey]
- 3) Control system by Nagrath & Gopal [TMH]
- 4) Modern Control System by Dorf [Addison Wesley]
- 5) Digital Control and State Variable Methods by Gopal [TMH]

**MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT - TRIBOLOGY
CODE - BE6152**

Unit-I: Introduction to Tribology

Definition, Scope, Applications, Friction, Definition, Scope, Laws of friction. Friction theories. Surface contaminants, Effect of sliding speed on friction.

Unit-II: Wear

Definition, Scope, wear of metals, Types, Classification. Mechanism of wear, Quantitative laws. Hypothesis of Holm. Hypothesis of Burwell and Strang. Hypothesis of Archard, Rawe, Rabinowicz. Quantitative law for Abrasive wear, Bayerku surface fatigue theory. Delamination theory & Fatigue theory of wear, wear resistant materials. Introduction to wear of Polymers and Ceramics. Wear reduction by Surface Improvements, Pitting, Erosion & Stress Corrosion.

Unit-III: Surface Interactions

Elastic & Plastic deformation of surfaces. Contact of Solids, Contact of Ideally Smooth Surfaces. Distribution of Pressure over elastic contact of two curvilinear bodies. Formulae for calculation of contact area. Physico-Mechanical properties of surface layers, Characteristics of Surface Geometry. Classes of surface roughness. Contact of rough surfaces. Interaction of surface peaks. Real and contour area of contact.

Unit-IV: Lubrication

Definition & Scope. Generalized Reynold's equation. Flow and shear stress, energy equation. Mechanism of pressure development in bearings. Concept of Boundry Layer.

Unit-V: Bearing design considerations & characteristics

Bearing design procedure & steps. Plain slider bearing. Step (Rayleigh step) bearing. Infinitely long journal bearing. Infinitely short journal bearing. Future scope and applications.

REFERENCE BOOKS:

1. Introduction to Tribology of bearings by – B. C. Majumdar., S Chand & Co.
2. Hand Book of Tribology – WHILEY
3. Fundamentals of Fluid film lubrication by – Bernard Hamrock, Mc Graw Hill International Edition.
4. Tribology in Industries by Sushil. K. Srivastava, S Chand & Publications.
5. Basic Lubrication theory by Alastair Cameron.

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT - EXPERIMENTAL STRESS ANALYSIS
CODE - BE6153

UNIT I

Two Dimensional Problems in Cartesian Coordinate system – Fundamentals of stress and strain, stress – strain relationship, Elastic constant, plane stress, plane strain, differentialequation of equilibrium Boundary conditions, Saint Venant’s principle, compatibility equation, Airys stress function. Stress analysis of cantilever subjected to concentrated load at it’s 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 \sim 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 option law, plane and circular Polaris cope arrangements, effect of stressed model in plane and circular polariscope, Isoclinic and Isochratics, 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 - MATERIAL HANDLING SYSTEM
CODE - BE6154

UNIT – I

Types of intraplant transporting facility, principal groups of material handling equipments, choice of material handling equipment, hoisting equipment, screw type, hydraulic and pneumatic conveyors, general characteristics of hoisting machines, surface and overhead equipments, general characteristics of surface and overhead equipments and their applications. Introduction to control of hoisting equipments.

UNIT – II

Flexible hoisting appliances like ropes and chains, welded load chains, roller chains, selection of chains hemp rope and steel wire rope, selection of ropes, fastening of chains and ropes, different types of load suspension appliances, fixed and movable pulleys, different types of pulley systems, multiple pulley systems. Chain and rope sheaves and sprockets.

UNIT – III

Load handling attachments, standard forged hook, hook weights, hook bearings, cross piece and casing of hook, crane grab for unit and piece loads, carrier beams and clamps, load platforms and side dump buckets, electric lifting magnets, grabbing attachments for loose materials, crane attachments for handling liquid materials.

UNIT – IV

Arresting gear, ratchet type arresting gear, roller ratchet, shoe brakes and its different types like electromagnetic, double shoe type, thruster operated, controller brakes, shoe brakes, thermal calculations of shoe brakes and life of linings, safety handles, load operated constant force and variable force brakes general theory of band brakes, its types and construction.

UNIT – V

Different drives of hoisting gears like individual and common motor drive for several mechanisms, traveling gear, traveling mechanisms for moving trolleys and cranes on runway rails, mechanisms for trackless, rubber-tyred and crawler cranes motor propelled trolley hoists and trolleys, rails and traveling wheels, slewing, jib and luffing gears. Operation of hoisting gear during transient motion, selecting the motor rating and determining braking torque for hoisting mechanisms, drive efficiency calculations, selecting the motor rating and determining braking torque for traveling mechanisms, slewing mechanisms, jib and luffing mechanisms. (Elementary treatment)

TEXT BOOK

1. Materials Handling Equipment – N. Rudenko, Envee Publishers, New Delhi
2. Materials Handling Equipment – M.P. Alexandrov. Mie publications, Maskow

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT - ENERGY CONVERSION SYSTEM LAB
CODE - BE616

EXPERIMENTS TO BE PERFORMED

1. Determination of Mechanical and volumetric efficiency of Reciprocating Air Compressor.
2. Testing of Reciprocating Air Compressor.
3. Determination of efficiency and Pressure distribution of Axial Flow Compressor.
4. Performance testing of Axial Flow Compressor.
5. Measurement of collector efficiency of a Flat Plate Collector.
6. Performance and Testing of a Flat Plate Collector.
7. Determination of collector efficiency of a Parabolic Focusing Collector.
8. Performance and Testing of a Parabolic Focusing Collector.
9. Solar Cooker: Testing and Performance.
10. Testing and Performance of a Photovoltaic Solar Panel.
11. Study and Performance of La-Mont Boiler
12. Study and Performance of Benson Boiler
13. Study and Performance of Velox Boiler
14. Study and Performance of Simple Steam Turbine

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. Reciprocating air compressor test rig
2. Axial flow compressor with flow discharge tunnel.
3. Flat plate solar collector with solar pump.
4. Focusing type parabolic solar collector.
5. Modified conjugate electrical backup type solar collector.
6. Solar Modules Panels – 20 watt, 40 watt, 110 watt.
7. La-Mont boiler model.
8. Benson boiler model.
9. Velox boiler model.
10. Experimental setup of Simple Impulse Turbine.

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT - NON DESTRUCTIVE TESTING LAB
CODE - BE617

EXPERIMENTS TO BE PERFORMED

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 Zyglo 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.

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT - INDUSTRIAL ENGINEERING LAB
CODE - BE618

EXPERIMENTS TO BE PERFORMED

1. To prepare the charts & diagrams for a selected problem according to the existing method and an improved method -men type flow process chart.
2. To prepare the charts & diagrams for a selected problem according to the existing method and an improved method -material type flow process chart
3. To prepare the charts & diagrams for a selected problem according to the existing method and an improved method -machine type flow process chart
4. To prepare the charts & diagrams for a selected problem according to the existing method and an improved method – multiple activity chart.
5. Study of principles of fundamentals of hand motion.
6. Study & applications of principles of motion economy.
7. Performance of micro motion study of a job.
8. Problems in assignment of men & machines.
9. Training for a performance rating using walking exercises / audio visual aids.
10. Calculation of allowance for a job.
11. Standard time calculation problems.
12. Problems of wage incentive.
13. Case study of an industrial/service organization using a method study techniques.
14. Stop watch time study of a job.

MATS UNIVERSITY
SEMESTER – VI
BRANCH – MECHANICAL
SUBJECT- MACHINE DESIGN-II LAB
CODE - BE619

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.