



MATS UNIVERSITY

Raipur (C.G.)

Syllabus Scheme

(7th 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.

7th Semester (MECHANICAL)

S.No.	Subject Code	Subject Name
1	BE710	Operation Research
2	BE711	Automobile Engineering
3	BE712	Heat and Mass Transfer
4	BE713	Total Quality Management
5	Refer Table	Elective - II
6	BE715	Automobile Engineering Lab
7	BE716	Heat and Mass Transfer Lab
8	BE717	Minor Project and Seminar
9	BE718	Quality Control Lab

Table – 2

Elective – II

S.N.	Subject Code	Subject Name
1	BE7140	Mechanical Vibrations
2	BE7141	Steel Technology
3	BE7142	Nuclear Engineering
4	BE7143	Product Development
5	BE7144	Plant Engineering and Maintenance



MATS UNIVERSITY

ARANG, RAIPUR



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

S.N.	code	Subject	Periods per week			Scheme of marks		Total Marks
			L	T	P	ESE	IM	
1.	BE710	Operation Research	4	1	-	70	30	100
2.	BE711	Automobile Engineering	4	1	-	70	30	100
3.	BE712	Heat and Mass Transfer	4	1	-	70	30	100
4.	BE713	Total Quality Management	4	1	-	70	30	100
5.	Refer Table	Elective - II	4	1	-	70	30	100
6.	BE715	Automobile Engineering Lab	-	-	3	20	30	50
7.	BE716	Heat and Mass Transfer Lab	-	-	3	20	30	50
8.	BE717	Minor Project and Seminar	-	-	3	20	30	150
9.	BE718	Quality Control Lab	-	-	3	20	30	50
Total			20	5	12	430	270	800

L – Lecture, T – Tutorial, ESE – End Semester Examination,

P – Practical, IM – Internal Marks (Include Class Test & Teacher's Assessments)

Table - 2
Elective - II

S.N.	Subject Code	Subject
1	BE7140	Mechanical Vibrations
2	BE7141	Steel Technology
3	BE7142	Nuclear Power Plant
4	BE7143	Product Development
5	BE7144	Plant Engineering and Maintenance

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- 7TH
BRANCH - MECHANICAL
SUBJECT - OPERATION RESEARCH
CODE - BE710

UNIT I

Introduction

Various stages of O.R., Fields of application, optimization and its classification. General Linear Programming Problems- Introduction, maximization and minimization of function with or without constraints, formulation of a linear programming problem, graphical method and simplex method, Big M method degeneracy, application of L.P.P. in Mechanical Engineering.

UNIT – II

The Transportation Problems

Mathematical formulation computational procedures, Stepping stone method, Modified Distribution Method, Vogels Approximation Method, Solution of balanced and unbalanced transportation problems and case of Degeneracy.

The Assignment Problems

Mathematical formulation of assignment problems, solution of assignment problems, traveling salesman problems, Air crew Assignment problems.

UNIT - III

Waiting Line Theory

Basic queuing process, basic structure of queuing models, some commonly known queuing situations Kendall's service time, solution to M/M/1: ∞ /FCFS models.

Network Analysis

CPM/PERT, Network Representation, Techniques for drawing network. Resource smoothing and leveling, project cost, Optimum project duration, project crashing, updating, Time estimation in PERT.

UNIT – IV

Game Theory

Introduction, two person zero sum game, methods for solving two person zero sum game: when saddle point exists, when no saddle point exists, solution of $2 \times n$ and $m \times 2$ game.

UNIT – V

Simulation

Basic concept of simulation, applications of simulation, merits and demerits of simulation, Monte Carlo simulation, simulation of Inventory system, simulation of Queuing system.

Note: Four questions to be set, one from each unit.

TEXT BOOKS

1. Operation Research ,SasienYaspan
2. Operation Research – N. D. Vohra – TMH
3. Operation Research– Hira& Gupta – S. Chand & Co.

REFERENCES

1. Operation Research – H. Gillette – TMH, New Delhi
2. Operations Research – M. Taha – TMH, New Delhi
3. Fundamentals of Operation Research – AckofSasieni – DhanpatRai& Sons
4. Quantitative Approach to Management – Lovin and Krit Patrick – TMH
5. Operation Research– S.D. Sharma – S. Chand & Com. New Delhi

MATS UNIVERSITY
SEMESTER - 7th
BRANCH - MECHANICAL
SUBJECT - AUTOMOBILE ENGINEERING
CODE - BE711

UNIT-I

Chassis & Frame - Layout of chassis & its main components, types of frames, conventional frames & unitized chassis.

Suspension system & Springs - Objects & principles of suspension, system, types, rigid axle suspension & Independent suspension for front & rear ends, simple & double arm parallel & perpendicular type of suspension system. Gas filled suspension system.

Springs - Purpose, types viz. leaf, coiled, rubber, air, suspension system, torsion bar, stabilizer, Telescopic damper.

UNIT – II

Clutches

Characteristics, functions, principles of operation of clutch, friction clutch, single plate, multi plate, centrifugal clutch, positive clutch, friction plate clutch lining materials. Torque transmitted and related problems.

Fluid flywheel

Construction, principles of working & characteristics.

UNIT – III

Gear Box: Object of Gear Box, Air, rolling & gradient resistance, tractive effort variation with speed, performance curve.

Types of Gear Boxes:- Sliding mesh, constant mesh, synchromesh device, automatic transmission, overdrive, lubrication of gear box.

Torque converter: Principles of working, characteristics, Torque converter with direct drive.

Testing of automobiles

UNIT – IV

Universal Joint:- Types, propeller shaft, slip joint.

Differential – Functions, single & double reduction differential, limited slip differential.

Front Axle: Live & dead axle, stub axle.

Back Axle: Hotch kiss drive, torque tube drive.

Brakes & Braking system: Purpose, principles, layout of braking system. Classification, mechanical, hydraulic,

master cylinder, Tandoma master cylinder wheel cylinder, self energizing & self adjusting brakes, disc brakes,

antiskidbrakes.power operated brakes:

UNIT – V

Steering system:- Gear & links, types of steering gears, reversibility of steering, center point steering, steering geometry viz castor, camber, king pin inclination toe in, toe out, cornering power, under-over steer; power steering, effect of shimmy, condition of true rolling, calculation of turning radius. Correct steering equation and related problems.

TEXT BOOKS

1. Automobile Engineering – Kripal Singh – Standard Publications
2. Automobile Engineering – G.B.S. Narang – Khanna Publishers

REFERENCE BOOKS

1. Automobile Engineering - Dr. N. K. Giri – Khanna Publishers
2. Automobile Engineering – K. R. Govindan – Anuradha Agencies
3. Automotive Mechanics – Heitner
4. Motor Vehicle – Newton & Steeds – Life & Sons Limited.

MATS UNIVERSITY
SEMESTER - 7TH
BRANCH - MECHANICAL
SUBJECT - HEAT AND MASS TRANSFER
CODE - BE712

UNIT – I

Introduction

General equation of conduction in Cartesian and cylindrical coordinates. Various modes of heat transfer, Fourier's, Newton's and Stefan Boltzman's Law, Combined modes of heat transfer, thermal transfer, thermal diffusivity, overall heat transfer coefficient.

Conduction

The thermal conductivity of solids, liquids and gases, factors influencing conductivity measurement. The general differential equation of conduction. One dimensional steady state conduction, linear heat flow through a plane and composite wall, tube and sphere, critical thickness of insulation, Effect of variable thermal conductivity, Conduction with heat generation in flat and cylinders.

UNIT - II

Fins

Analysis of pin fins, conduction through infinite & semi infinite slab and cylinder. Conduction convection system, extended surfaces rectangular, triangular, circumferential and pin fins. General conduction analysis, fins of uniform and non-uniform cross sectional area. Heat dissipated by a fin. Effectiveness and efficiency of fins. Approximate solution. Design of fins for maximum heat transfer. Solution for different boundary condition. Use of fin analysis for measuring temperature error of Thermometer.

Transient/Unsteady State Heat Conduction

System with negligible internal resistance, Lumped capacity method and its Validity. Unsteady state conduction through finite and semi- infinite slab without surface resistance, convection boundary conditions. Solution through Heisler's chart.

UNIT – III

Forced Convection

Physical Mechanism of Forced Convection, Dimensional analysis for forced convection, velocity and Thermal Boundary layer, Flow over plates, Flow across cylinders and spheres, Flow in tubes, Reynold's analogy. Derivation of laminar heat transfer coefficient for pipe internal flow., Heat transfer over laminar And turbulent flow over flat plates.

Natural Convection

Physical Mechanism of Natural Convection, Dimensional analysis of natural convection; empirical relationship for natural convection.

UNIT- IV

Two Phase Heat Transfer

Boiling heat transfer, Pool boiling, boiling regimes and boiling curve, next transfer correlations in pool boiling. Condensation heat transfer, Film condensation, derivation for the average heat transfer coefficient 'h' for the case of laminar film condensation over vertical plate, Heat transfer correlation for inclined plates, vertical tubes, Horizontal bank tubes.

Heat Exchangers

Different types of heat exchangers; Determination of heat exchanger performance, Heat exchanger transfer units, Analysis restricted to parallel and counter flow heat exchanger (LMTD and NTU method) Preliminary design of heat exchangers (i) liquid to liquid (ii) liquid to gas.

UNIT- V

Thermal Radiation

Introduction, absorption and reflection of radiant energy, Emission, Radiosity and irradiation, Black and non black bodies, Kirchoff's law; intensity of radiation, radiation exchange between black surface, geometric configuration factor. Grey body relation exchange between surface of unit configuration factors. Electrical analogy to simple problems. Non-luminous gas radiation. Errors in temperature measurement due to radiation.

Introduction to Mass Transfer

Mass and mole concentrations, molecular diffusion, eddy diffusion, Molecular diffusion from an evaporating fluid surface, Introduction to mass transfer in laminar and turbulent convection Combined heat and mass transfer, the wet and dry bulb thermometer.

TEXT BOOKS

1. Heat Transfer – S.P. Sukhatme – TMH
2. Heat & Mass Transfer – D.S. Kumar – S.K. Kataria & Sons
3. Heat transfer- C P Arora, TMH

REFERENCE BOOKS

1. Heat & Mass Transfer – K. Kannan – Anuradha Agencies
2. Heat Transfer – J.P. Holman – TMH
3. Heat Transfer – A Practical Approach – Yunus A. Cengel – McGraw Hill

MATS UNIVERSITY
SEMESTER - 7th
BRANCH - MECHANICAL
SUBJECT - TOTAL QUALITY MANAGEMENT
CODE - BE713

UNIT-I

Basic Concept of Quality

Quality and quality control, concept of quality, quality characteristics, Quality of design and quality of conformance, History of quality control, Quality policy and objectives, Economics of quality.

Statistical Concept of Variation

Concept of variation frequency distribution, continuous and discrete, probability distributions viz. Normal, Exponential and weibull distribution, pattern of variation, significance tests, Analysis of variance, statistical aids in limits and tolerances.

UNIT-II

Quality Assurance

Concept, advantages, field complaints, quality rating, quality audit, inspection planning, quality mindness, quality budget, vendor quality rating (VQR), vendor rating (VR), manufacturing planning for quality, Quality function deployment (QFD).

Statistical Quality Control

Objectives, Growth and applications of S.Q.C., S.O.C, Techniques in manufacturing planning. Process capability analysis, Control charts for variables and attributes and their analysis, process capability, concept of six sigma.

UNIT III

ACCEPTANCE SAMPLING

Fundamental concept in acceptance sampling, operating characteristics curve. Acceptance plans, single, double and introduction of multiple plans, LTPD, AOQL, AOQ.

UNIT -I V

Total Quality Management

Total Quality Control (TQC), Concept of Total Quality Management (TQM), TQM philosophies, Deming approach to TQM, Juran ten steps to Quality Management, Taguchi Philosophy, Crosby fourteen steps, TQM models, Tools and techniques of TQM,

UNIT V

Quality system

Quality system, need for quality system, ISO 9000 Quality Management Standards, ISO 9000:2000 requirement, Quality Auditing, ISO 14000, Benefits of ISO 14000.

TEXT BOOKS

1. Quality Planning and Analysis by Juran J.M. and Gryana FM. – McGraw Hill, New York
2. Statistical Quality Control – R.C. Gupta – Khanna Publishers, Delhi
3. Statistical quality control – E. L. Grant and R. S. Leavenworth – Mc. Graw Hill, New York

REFERENCE BOOKS

4. Engineering Statistics and quality control – I. W. Burr, Mc. Graw Hill, New York
5. Managing for Total quality from Deming to Tguchi and SPC. - Logothetis – Prentice Hall of India
6. Statistical Quality Control – M. Mahajan – DhanpatRai& Company – New Delhi

MATS UNIVERSITY
SEMESTER- 7th
BRANCH - MECHANICAL
SUBJECT - MECHANICAL VIBRATIONS
CODE - BE7140

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 dampings, 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 an undamped

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 analysers, balancing of rigid rotors

UNIT- IV

Analysis and measurement of sound:

One dimensional waves 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

Books:

1. Mechanical Vibrations by GK Grover, Hem chand and Bros, Roorkee
2. Mechanical Vibrations by KK Purjara, DhanpatRai and Sons, Delhi
3. Mechanical Vibrations by V.P.Singh,.

MATS UNIVERSITY
SEMESTER - 7th
BRANCH - MECHANICAL
SUBJECT - STEEL TECHNOLOGY
CODE - BE7141

Unit I PRINCIPLES OF STEEL MAKING

Development of steel making processes, physico-chemical principles and kinetic aspects of steel making, carbon boil, oxygen transport mechanism, desulphurisation, dephosphorisation, slag-functions, composition, properties and theories, raw materials for steel making and plant layout.

Unit II BESSEMER AND OPEN HEARTH STEEL MAKING

Acid and Basic Bessemer processes, Side Blown Converter, O.H-constructional features, process types, operation, modified processes, duplexing, pre-treatment of hot metal.

Unit III OXYGEN STEEL MAKING PROCESSES

Top Blown processes- L.D., L.D.A.C., bottom blown processes, combined blown processes, rotating oxygen processes-kaldo and rotor, modern trends in oxygen steel making processes.

Unit IV ELECTRICAL STEEL MAKING AND LADLE METALLURGY

Arc and Induction furnace-constructional features. Production practice for plain carbon steels, low alloy, stainless, tool and special steels, modern developments. Secondary steel making processes, continuous steel making processes.

Unit V DEOXIDATION AND TEEMING PRACTICE

Principle, methods and their comparison, killed, rimmed and capped steels, degassing practices, ingot production, ingot defects and remedies, continuous casting. Indian steel industry and global trends in steel making technology.

TEXT BOOK

1. Tupkary, R.H., "Modern Steel Making", 3rd Edition, Khanna Publications, New Delhi, 2000.

REFERENCES

1. Bashforth, G.R., "Manufacture of Iron and Steel", Vol.2, 3rd edition, Chapman & Hall, London, 1964.
- 2 "Making, Shaping and Treating of Steel", US Steel Corporation, 1994.

MATS UNIVERSITY
SEMESTER - 7th
BRANCH - MECHANICAL
SUBJECT - NUCLEAR ENGINEERING
CODE - BE7142

UNIT-1

Nuclear forces and binding energy of the nucleus, Nuclear stability and radioactivity, Law of radioactive decay.
Binary nuclear reactions, Energy release in fission and fusion reactions, concepts of microscopic and macroscopic cross sections.

UNIT-2

Nuclear fuels in fission and fusion reactors, Types of nuclear reactors, Fissile and fertile materials, Neutron chain reaction in fission reactors, Neutron flux, Concept of criticality for bare homogeneous reactors, Coolants, moderators, Control and structural materials.

UNIT-3

Heat generations and steady state temperature distribution in fuel elements, Heat removal, single and two phase heat transfer and fluid flow correlations.
Thermodynamic analysis of a nuclear power plants.

UNIT-4

Neutron lifetime, Delayed neutrons, Concept of reactivity and point reactor kinetics, Qualitative discussion of safety and radioisotopes in industry, Agriculture & medicine.
Brief discussion of safety and radioactive waste disposal.

UNIT-5

Interaction of nuclear radiation with matter, Shielding, Radiation exposure & dose, Applications of nuclear radiation & radioisotopes in industry, Agriculture & medicine.

Books:

- 1.Nuclear Reactor Engineering By S. Glasstone and A . Sesonske.
- 2.Basic Nuclear Engineering, by K.S. Ram.
- 3.Introduction to Nuclear Engineering, by J.R Iammarsh. Nuclear Electricity, by Ian Hore-Lacy.

MATS UNIVERSITY
SEMESTER - 7th
BRANCH - MECHANICAL
SUBJECT -PRODUCT DEVELOPMENT
CODE - BE7143

UNIT-I

Product Development Process Background for design, design theory design materials, human factors in design applied ergonomics, product development processes and organization, identifying customer needs, establishing product specifications, concept generation and selecting product architecture.

UNIT-II

Product Design Methods

Generating concepts, selection of a concept, Testing of concept, product architecture, Creative and rational clarifying objectives- the objective trees methods, establishing functions – the function analysis methods, setting requirement- requirements specification methods determining characteristics – the QFD method, generating alternatives-the morphological chart method, evaluating alternatives-the weighted objectives methods, improving details-the value engineering method and design strategies.

UNIT –III

Design for Manufacture

Estimating manufacturing costs, reducing component, assembly and support cost design for assembly, design for disassembly, design for environment, design for graphics and packaging, effective prototyping – principle and planning.

UNIT –IV

Industrial Design

Its need - Ergonomic needs, Aesthetic needs, impact, accessing the quality, steps involved in Industrial design process, Management of Technology & user driven products.

UNIT – V

Patents, Product Development & Project Management

Legal issues in product design, trademarks, trade-secret, copy rights, patents – types, steps for disclosure, design resources, economics – quantitative & qualitative analysis, management of product development projects, Design Structure Matrix, Gantt Chart, Project schedule, budget, risk plan, accelerating project, execution, assessing and correction, Intellectual property rights.

TEXT BOOKS

1. Karl. T. Ulrich and Steven D. Eppinger "Product Design & Development" – TMH – 3rd addition
2. Kevin Otto and Kristin wood "Product Design" –Pearson Education
3. ImadMoustapha "Concurrent Engineering in Product Design and Development" – New Age International Publishers
4. Chitale& Gupta, "Product Development", Tata McGraw Hill.
5. Monks, J.G, "Operations Management", McGraw Hill, 1977
6. Francis, R. L., and White, J. A., "Facility Layout and Location", Prentice Hall of India, 1974

MATS UNIVERSITY
SEMESTER - 7th
BRANCH - MECHANICAL
SUBJECT - PLANT ENGINEERING AND MAINTENANCE
CODE - BE7144

UNIT I: Organisation of Plant Engineering:

Principles of Plant management functions. Classification of maintenance work-Routine maintenance, emergency work, service work, preventive maintenance. Project work, Corrective work, Assessment of maintenance work. Performance and productivity measurement; problem solving techniques. Statistical processes. Parato chart. Manpower planning and training for maintenance and safety staff.

UNIT II: Plant Facilities and Layout Planning:

Basic Plant facilities, (a) Building: Types of Building structures, Ventilation and lighting, Roads and parking. (b) Electrical power generation, distributions, utilisation, stand by units. (c) Heating, ventilation and Air conditioning. (d) Water supply, Purification, use and disposal. (e) Sanitation. (f) Planning and estimation of auxiliary services, such as water, steam, compressed air.

Layout of facilities-Types of layouts, selection of layout. Group technology aspect. P. Q. Analysis, PQRST analysis, material flow, REL charts, space requirements, space diagram. Use of computer for optimization of layouts.

UNIT III: Maintenance Management Practice:

Various types of maintenance, breakdown, preventive, periodic or predictive, condition based maintenance as predictive preventive maintenance. Online or off-line, concept of health as well as usage monitoring. Quantitative decision making for selection of maintenance system & management classification of material, MICLASS, CUSDD, Software for Classification and Coding. Maintenance problems occurring in product and process type industries and Power plants and their management.

Spare Parts Management- Simulation and Software needed for spare parts management and inventory planning.

UNIT IV; Preventive Maintenance and Life Cycle Costing:

Periodic Preventive Management - Scheduled maintenance and period for P.M. Life cycle cost taking into consideration maintenance, reliability, hazard function etc. Life cycle costing: Rigorous models, mathematical formulation etc.

UNIT V: Plant Safety issues and Energy conservation:

Plant safety-fire protection and prevention, safety against mechanical hazards, chemical hazards, accident prevention practices and codes. Pollution control-Waste disposal, existing limiting norms. Recycling of waste. Energy conservation, management and audit. Material handling equipments.

Term Work:

Any six assignments based on the above syllabus (One from each unit)

Text Books:

1. A. K. Gupta, "Terotechnology & Reliability Engineering", McMillan Co.
2. Sushikumar Srivastava, "Industrial Maintenance Management", S.Chand and Co.Ltd., New Delhi.
3. R.C. Rosaler-Handbook of Plant Engineering-McGraw Hill.ISBN 0070521646

Reference books:

1. B.Bhadury and S.K. Basu, "Terotechnology: Reliability Engineering and Maintenance Management", Asian Books, New Delhi 2002.
2. A. K. S. Jardine, "Maintenance, Replacement & Reliability" HMSO, London.
3. R.A. Collacatt, "Mechanical fault Diagnosis and Condition Monitoring", Chapman and Hall Ltd.ISBN 0412129302
4. Higgin-Handbook of Maintenance Engineering- McGraw Hill.
5. Rudenko-Material, Handling equipment-MIR:- Publication.
6. Jacob Fruchlboum-Bulk Material Handling, Handbook; CBS Publisher & distributor, ISBN 8123905416
7. H.P. Garg -Industrial Maintenance, S. Chand and Co. New Delhi, ISBN8121901685
8. Edward Srivastava-Maintenance Management.

MATS UNIVERSITY
SEMESTER – 7th
BRANCH – MECHANICAL
SUBJECT - AUTOMOBILE ENGINEERING LAB
CODE - BE715

EXPERIMENTS TO BE PERFORMED

1. Study of Frame and Chassis.
2. Study of Clutches – Single Plate, Multi Plate and Centrifugal
3. Study of Gear Boxes – Sliding mesh, Constant mesh, Synchro mesh.
4. Study of Differential, Universal joints, Axles and Slip Joints.
5. Study of Brakes – Mechanical, Hydraulic, Air Brake and Disc Brake.
6. Study of Steering System used with Rigid Axle suspension and independent suspension system, Power Steering
7. Study of different types of springs used in Automobiles.
8. Study of Rigid Axle suspension system.
9. Study of Front Independent Suspension System.
10. Study of Rear Independent Suspension System.
11. Study of Battery, Starting and Generating System and Battery Charging System.
12. Study of Automotive Electrical System.
13. Study of Educational Car Model.

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. Working model of Single plate, Multi-plate & Centrifugal Clutch
2. Working model of Actual Differential System
3. Working model of Universal Joint, Axles & Slip Joints
4. Working model of Mechanical, Hydraulic and Air Brake
5. Working model of Steering System used with Rigid Axle suspension System
6. Working model of Steering System used with Independent Suspension System
7. Different types of Springs used in Automobiles
8. Working model of Rigid Axle Suspension System
9. Working model of Front Independent Suspension System
10. Working model of Rear Independent Suspension System
11. Working model of Battery, Starting and Generating System along with charging unit
12. Working model of Electrical System
13. Cut section of Actual Master Cylinder of Hydraulic Brake System
14. Educational Car Model

MATS UNIVERSITY
SEMESTER –VII
BRANCH – MECHANICAL
SUBJECT - HEAT & MASS TRANSFER LAB
CODE - BE716

EXPERIMENTS TO BE PERFORMED

1. To Determine Thermal Conductivity of Insulating Powders.
2. To Determine Thermal Conductivity of a Good Conductor of Heat (Metal Rod).
3. To Measure the thermal Conductivity of Liquid.
4. To determine the transfer Rate & Temperature Distribution For a Pin Fin.
5. To Measure the Emmissivity of the Test plate Surface.
6. To Determine Stefan Boltzman Constant of Radiation Heat Transfer.
7. To Determine the Surface Heat Transfer Coefficient For Heated Vertical Cylinder in Natural Convection.
8. Determination of Heat Transfer Coefficient in Drop Wise & Film Wise condensation.
9. To Determine Critical Heat Flux in Saturated Pool Boiling.
10. To Study Performance of Simple Heat Pipes.
11. To Study and Compare LMTD and Effectiveness in Parallel and Counter Flow Heat Exchangers.
12. To Find the Heat transfer Coefficient in Forced Convection in a tube.
13. To determine the total thermal conductivity and thermal resistance of the given compound resistance in series.
14. To find out the thermal conductivity of given slab material.
15. To determine the individual thermal conductivity of different lagging in a lagged pipe.
16. To study the rates of heat transfer for different materials and geometries
17. To understand the importance and validity of engineering assumptions through the lumped heat capacity method.
18. Testing and performance of different heat insulators.

LIST OF EQUIPMENTS/MACHINES REQUIRED

1. Thermal Conductivity Of Insulating Powder Apparatus
2. Thermal Conductivity Of Metal Bar Apparatus
3. Thermal Conductivity Of Liquid Apparatus
4. Transfer Rate And Temperature Distribution For A Pin Fin Apparatus
5. Emmissivity Of The Test Plate Surface And Plotting A Graph Of Emmissivity Versus Temperature Apparatus
6. Stefan-Boltzman Constant Of Radiation Of Heat Transfer Apparatus
7. Surface Heat Transfer Coefficient For Heated Vertical Cylinder In Natural Convection Apparatus
8. Heat Transfer Coefficient In Drop Wise And Film Wise Condensation Apparatus
9. Critical Heat Flux In Saturated Pool Boiling Apparatus
10. Performance Of Different Heat Pipe Apparatus
11. Heat Transfer Rate Through Heat Exchanger Apparatus
12. Heat Transfer Coefficient In Forced Convection of Air in a Tube Apparatus
13. Heat transfer through composite wall Apparatus
14. Thermal conductivity of insulating slab Apparatus
15. Heat transfer through lagged pipe Apparatus
16. Unsteady state heat transfer Apparatus
17. Testing and performance Test Rig for heat insulators.

MATS UNIVERSITY
SEMESTER – VII
BRANCH – MECHANICAL
SUBJECT – MINOR PROJECT AND SEMINAR
CODE – BE717

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

MATS UNIVERSITY
SEMESTER – VII
BRANCH – MECHANICAL
SUBJECT - QUALITY CONTROL LAB
CODE – BE718

EXPERIMENTS TO BE PERFORMED

Each student shall submit report for Quality Testing and how it control of real mechanical component that's made on workshop at least five different- different jobs to be chosen by student in group. At least one industrial visit must to observe the Quality management in it.

