

B.Tech. (Seventh Semester) Mechanical Engineering

MET- 401 Automobile Engineering

L	T	P/D	Total	Theory : 75 marks
4	1	-	9; 5	Sessional : 50 marks

Duration of Exams. : 03 hours

1. Introduction to Automobile Engineering:

Brief history of automobiles, Main components of an automobile, Brief description of each component.

2. Power requirements in an automobile:

Brief description of constructional details and working of a four stroke I.C. Engine (S.I. Engines and C.I. Engines) including lately developed overhead cam shaft, Multi-cylinder engines, Introduction to recent developments in I.C. Engines- Direct injection systems, Multi-point fuel injection systems, Microprocessor based fuel supply systems, Multi valve engines, Mechanical balancing, Firing Order, Power balancing, Power overlap, Power flow charts.

3. Transmission System of Automobile:

Introduction, Brief description of different components of Transmission System.

(a) Clutch: Introduction to Clutch and its different types, Principle of Friction Clutch, Clutch Lining and friction materials used in Friction Clutches, Torque transmitted, Brief description of Cone Clutch, Single Plate and Multiplate Clutches, Dry and wet clutches, Automatic clutch action, Centrifugal clutches, Electromagnetic clutches, Fluid Flywheel.

Gear Box: Air resistance, gradient resistance and rolling resistance coming across a moving automobile, Tractive effort, Variation of tractive effort with speed, Performance curves (object and need of a gear box), Sliding mesh gear box, Control mechanism, Sliding type selector mechanism, Ball type selector mechanism, Steering column gear shift control, Constant mesh gear box, Synchromesh device, Automatic transmission in general, AP automatic gear box, Torque converter, Torque converter with direct drive, Lubrication of Gear Box.

Propeller Shaft: Functions and requirements of a propeller shaft, Universal joints, Constructional forms of universal joints, Flexible-ring joints, Rubber-bushed flexible joints. Constant-velocity joints.

Differential: Principle of operation, Constructional details of a typical differential unit, Traction control differentials, Multi-plate clutch type traction control device, Traction control by viscous coupling.

The back axle: Live back axles, The final drive, Single reduction live axles, Torque reaction, Driving thrust, Torque and thrust member arrangements, Springs serving as torque and thrust members, Hotchkiss Drive with torque reaction member, Single combined torque-thrust reaction member, with springs taking only vertical and lateral loads, Transverse radius rods, Three radius rods, Axle construction, Effects of wheel bearing layout on axle loading, Some actual bearing arrangements, Axle casing construction, The double reduction axles.

4. Running System:

Wheels and rims, Tyre-its function and constructional details.

Brakes: Functions and methods of operation, Brake efficiency, Elementary theory of shoe brake, Brake shoe adjustments, A modern rear-wheel brake, Disc brakes, Brake linkages, Leverage and adjustment of the brake linkage, Servo- and power-operated brakes, Vacuum brake operation, Hydraulic Brakes-constructional details and working, Bendix Hydrovac, Direct-acting vacuum servos, Power-operated brakes, A dual power air brake system, Compressed air systems, Actuating cylinders for air brakes.

5. Suspension System:

Suspension principles, Road irregularities and human susceptibility, Suspension system, Damping, Double tube damper, Single tube damper, Lever arm type damper, Springs-Leaf springs, Coil and torsion springs, variable rate springs, Composite leaf springs, Rubber springs, Air springs, Adjustable and self-adjusting suspensions, Interconnected suspension system, Interconnected air and liquid suspensions, Independent suspension system, Different independent suspension layouts, McPherson strut type, Rear suspension-live axle, Torque reaction and axle guidance, Watt's linkage, Rear suspension-dead axles, Rear suspension-independent, McPherson strut rear suspension.

6. Steering Mechanism:

Steering geometry, Castor, Camber, Kingpin inclination, Combined angle, Toe-in, Steering system-basic aims, Ackerman linkage, Steering linkages for independent suspension, Center point steering, Costarring or trailing action, Cornering power, Self-righting torque, Steering characteristics-over steer and under steer, Axle beam, Stub-axle construction, Steering column, Reversible and irreversible steering, Rack-and-pinion steering mechanism, Effect of toe-in on steering, Power steering, Vickers System.

7. Recent trends in Automobile Engineering:

Multi-fuel automobiles, Automobiles running on alternate sources of energy, Emission control through catalytic converter, Double catalytic converter, Aspects of pollution control in Automobiles.

Reference and Text Books:

1. The Motor Vehicle

- By Newton, Steeds and Garrette Basic

Automobile Engineering

- By Kirpal Singh

Automobile Engineering

-By K.M. Gupta, Umesh Publications

Automotive Mechanics

- Crouse

B.Tech. (Seventh Semester) Mechanical Engineering

MET- 403 Measurements and Control

L	T	P/D	Total	Theory : 75 marks
4	1	-	9; 5	Sessional : 50 marks

Duration of Exams. : 03 hours

1. Introduction:

Definition, application of measurement instrumentation, functional elements of a generalized measuring system, measuring standards, types of measurement, types of input to measuring instruments and instrument system, classification of measuring instruments, merits and demerits of mechanical measuring systems, comparison of mechanical measuring system with electrical measuring systems, calibration.

2. Generalized performance characteristics of instruments:

Introduction, types of error, types of uncertainties, propagation of uncertainties in compound quantity, Static performance parameters: accuracy, precision, resolution, static sensitivity, linearity, hysteresis, dead band, backlash, and drift., sources of error, selection of a measuring instruments, mechanical and electrical loading, fundamentals of dynamic characteristics, generalized mathematical model of measuring systems, types of input, dynamic performance parameters: dynamic error, speed of response, etc, dynamic response of a first order mechanical systems with different inputs e.g. step, ramp, sinusoidal and impulse input.

3. Statistical analysis of experimental data:

Introduction, types of measuring data, statistical attributes, various method of presentation, estimation of presentation and uncertainties, confidence level, precision and statistical treatments of single and multi sample type experimental data, Chauvenet's criteria of rejecting a dubious data, curve fitting, best linear calibration and its precision, significant figures and rounding off. Overall uncertainty estimation of measuring systems, common sense approach, and engineering applications.

4. Transducers:

Introduction, primary function, classification, electrostatic transducers: principle theory, types, advantages, and limitations, Fixed contact mechano-resistive transducers: classification, and uses, Metallic resistance strain gauge: types, construction theory of operation, Adhesive: property, selection criteria, mounting of strain gauges, Mathematical analysis of ballast and DC Wheatstone bridge circuits, characteristic and comparison of ballast and DC Wheatstone bridge circuits, temperature effects and their compensation

5. Measuring of non-electrical physical quantities:

Measurement of load, force, and thrust using resistant strain gauges, Elastic load cells, proving rings, fluid pressure measurement in pipe and containers, using strain gauges, Measuring of torque in transmission shaft under axial and bending loads in varying ambient conditions.

6. Control Systems:

Introduction, classification of control systems, control system terminology, servomechanism, process control and regulators, Manual and automatic control systems, physical systems and mathematical models, linear control systems, Laplace transform, transfer function, block diagram, signal flow graphs, system stability, Time and frequency domain.

7. Hydraulic and Pneumatic control systems:

Introduction, functional operation, desirable characteristics of hydraulic fluids, hydraulic control systems: hydraulic pump, hydraulic control valve, Pneumatic control systems: pneumatic nozzle, relay, advantages and limitation of such control systems.

Reference and Text Books:

1. Mechanical measurements & control

- By D.S. Kumar, Metropolitan book

Instrumentation and Mechanical measurements

- By A.K. Tayal, Galgotia Publ.

3. Measurements systems application and design

-By Ernest Doebelin, McGraw-Hill

B.Tech. (Seventh Semester) Mechanical Engineering

MET- 405 Statistical Quality Control and Reliability

L	T	P/D	Total	Theory : 75 marks
4	1	-	9; 5	Sessional : 50 marks

Duration of Exams. : 03 hours

1. Introduction:

Quality-Basic Concepts: Issues in Quality, factors affecting quality, creating quality by design, product development cycle, economics of quality, Various definitions, ISO definition of quality and its meanings, and various phases till TQM and its meaning to industries, customers and employees, contribution of quality gurus etc. towards quality concepts. Total Quality Management: its scope, application and implementation. Quality Circle: its objectives, structure and techniques. Variability concept in manufacturing-cycle, fishbone diagrams, charts in time philosophy.

2. Quality Control:

Basic statistical concepts, various types of distributions, General theory X and R chart. Decision preparatory to the control charts. Trial control limits. Selection of subgroups. Charts with variable subgroups, Reject and Revoke, limits for average on X charts, modified control limits, specification limits, practical limitations. Control charts for fraction defectives, calculation and plotting of control limits, sensitivity of p chart, applications. Control charts for Defects, difference between defect and defective, calculation and plotting of control limits, applications. pi charts and u charts, plotting of charts. Tests for various control charts. Process capability- inherent and potential capability.

3. Acceptance Sampling:

Purpose of Acceptance by Attributes, Single sampling plans. O.C. curve, selection of sampling plans, Acceptance number, Type A and Type B O.C. curves, Double sampling plan and its analysis, Multiple and sequential sampling, A.O.Q.L., Acceptance sampling plans under risk. Design of various sampling plans, Dodge-Roming type system for acceptance sampling by attributes (use of various tables). Determination of process average, Acceptance sampling by variables.

4. Reliability:

Control of reliability, factors affecting reliability, pattern of failure, mean time to failure, Fundamental of statistical concepts, consideration of reliability in series and parallel system, effect of redundancy and reliability, method of reliability evaluation, reliability optimization, Availability and Maintainability, means to improve reliability, reliability control during manufacture.

Reference and Text Books:

1. Statistical Quality Control

- By Grant and Leaven, McGraw-Hill

Quality Control and Reliability

- By Mahajan, Dhanpat Rai.

3. Quality Control

-By Hansen, Prentice- Hall

B.Tech. (Seventh Semester) Mechanical Engineering

MET- 407 Measurements and Control (Practical)

L	T	P/D	Total	Practical	: 25 marks
-	-	2	9; 2	Sessional	: 50 marks

Duration of Exams. : 03 hours

List of Experiments

1. Study of a strain gage based cantilever beam and measurement of strain on the beam
2. Study of a LVDT and measurement of linear displacement
3. Study of an inductive pick up and measurement of linear displacement
4. Study of a LDR and measurement of linear displacement
5. Study of capacitive pick up and measurement of angular displacement
6. Study of temperature transducers and measurement of temperature of fluid
7. Study of a LVDT (strain gage based) and measurement of linear displacement
8. Study of a torque pick up and measurement of torque

9. Study of a pressure pick up and measurement of pressure of fluid
10. Study of load cell and measurement of load with load cell
11. Study of non-contact type speed pick up and measurement of rotational speed
12. Comparison of sensitivity of thermocouple, thermister and RTD

Note: The students must perform atleast eight experiments.

B.Tech. (Seventh Semester) Mechanical Engineering

MET- 409 Project - I

L	T	P/D	Total	Viva-voce	: 75 marks
-	-	7	9; 7	Sessional	: 100 marks
				Duration of Exams. : 03 hours	

The student is expected to take up a project under the guidance of teacher from the college. The project must be based on the mechanical engineering problems, which will extend full academic session in two parts. The student may be asked to work individually or in-group with not more than four students. Viva-voce must be based on the preliminary report submitted by student(s) related to project.

B.Tech. (Seventh & Eighth Semester) Mechanical Engineering

MET- 411 Seminar

L	T	P/D	Total	Sessional	: 50 marks
-	-	2	9; 2		

Student will give a talk on some new technical topics.

Note: The seminar will continue in the eighth semester and will be evaluated in the eighth semester.

B.Tech. (Seventh Semester) Mechanical Engineering

MET- 413 Practical Training Report

L	T	P/D	Total	Sessional : 75 marks
-	-	-	-	Duration of Exams. : 03 hours

Student will submit summer training (about 6 weeks industrial training) report for his/her assessment.

B.Tech. (Seventh Semester) Mechanical Engineering

MET-437 Total Quality Management

L	T
3	1

General:

Concept of Quality, Quality as the basis of market competition, Historical review, Quality philosophy of Deming, Juran, Crosby etc., Obstacles, Integrating productivity and Quality. (7 Lectures).

Human Factors in Quality Management:

Organization of Quality, Quality council, Total Quality Culture, Quality leadership, Quality awards, Total employee involvement, Quality circles, Attitude of top management, executives and workers, Operators responsibility of Quality, causes of operator's errors, Motivation. (8 Lectures).

Total Quality Management:

Introduction to TQM, Models for TQM, TQM implementation, Advantages of TQM, Obstacles to TQM, TQM in service sector. (5 Lectures).

Tools and Techniques of TQM:

Concepts of Quality function deployment, cause and effect diagram, SWOT analysis, Continuous improvement, PDCA cycle, Supplier partnership, Supplier certification, Pareto diagram, Scatter diagram, Benchmarking, Taguchi's Quality Engineering, Failure mode and effect analysis, Total productive maintenance, Introduction to JIT, JIT Quality management, SQC, SPC, BPR, Kaizen, Six sigma concept ..

ISO 9000:

Introduction to ISO 9000 series of standards, other quality systems, Implementation, Documentation, Internal audits, Registration, Closing Comments.

Beyond ISO 9000:

Beyond ISO 9000 horizon, Introduction to ISO 14000, Series standards, Concepts of ISO 14001, EMS Benefits, ISO 10011- 10014, Quality systems .

Suggested Books:

1. Total Quality Management By Bosterfied et al.
Person Education India, 2001.
2. The Essence of Total Quality Management By Johan Bank,
Prentice Hall of India 2000.
3. Managing for Total Quality ; ; By
Logothetis,
Prentice Hall of India, 2000.
4. Total Quality Management ;
; By Sundra Raju,
Tata Mcgraw Hills publishing company, 1997.
5. TQM and ISO 9000 By K.C. Arora,
S.K. Kataria & Sons 2000.
6. ISO 9000 Quality System By Dalde & Saurabh,

Standard Publishing, 1994.