

Mechanical Measurement & Metrology

T.E. Sem. V [MECH/AUTO]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. Significance of Mechanical Measurements, Classification of measuring instruments, generalized measurement system, types of inputs: Desired, interfering and modifying inputs.
Static characteristics: Static calibration, Linearity, Static Sensitivity, Accuracy, Static error, Precision, Reproducibility, Threshold, Resolution, Hysteresis, Drift, Span & Range etc.
Error in measurement: Types of errors, Effect of component errors on combination and distribution of combination errors on components, Probable errors.
2. **Displacement measurement:** Transducers for displacement measurement, Potentiometers, LVDT, Capacitance type, Digital transducers (optical encoder), Nozzle flapper transducer.
Strain measurement: Theory of Strain Gauges, Gauge factor, Temperature compensation, Bridge circuit, Orientation of Strain Gauges for Force and Torque measurement, Strain Gauge based Load Cells and Torque Sensors.
3. **Measurement of angular velocity:** Tachometers, Tachogenerators, digital tachometers and Stroboscopic methods.
Pressure measurement: Pressure standards, Elastic pressure transducers viz. Bourdon Tubes, Diaphragm, Bellows and piezoelectric pressure sensors. High-pressure measurements, Bridgman gauges Calibration of pressure sensors.
Vacuum measurement: Vacuum gauges viz. McLeod gauge, Ionization and Thermal Conductivity gauges.
4. **Acceleration Measurement:** Theory of accelerometers and vibrometers. Practical Accelerometers, strain gauge based and piezoelectric accelerometers.
Temperature measurement: Thermodynamic Temperature Scale and IPTS. Electrical methods, of temperature measurement, Resistance thermometers, Thermistors and Thermocouples, Pyrometers.
5. **Metrology**
Standard of measurement, line and end standards wave length standard, working standards, requirements of interchangeability, allowance and tolerance, limits and fits, B.S. and I.S. specifications for limits and fits, limits gauging, automatic gauging, needs in semi-automatic, automatic production, principle of operation, features of in process gauging system.
6. Use of comparators such as mechanical, optical, electrical, electronics and pneumatic. Angular measurements, angle gauges, sine bar, levels, clinometers and taper gauges. Metrology of screw threads, limits gauging of screw threads. Gear measurements. Measurement of flatness and square ness, surface finish definition and measurement of surface texture, study and use of profile projector and tool maker's microscope, dividing head and auto-collimator.

References :

1. Experimental Methods for Engineers (*J.P.Holman*) McGraw Hills Int. Edition.
2. Engineering Experimentation (*E.O.Doebelin*) McGraw Hills Int. Edition.
3. Mechanical Measurements (*S.P.Venkateshan*) Ane books, India
4. Metrology for Engineers (*J.F.W Galyer & C.R.Shotbolt*)
5. Theory and Design for Mechanical Measurements, 3rd ed., Wiley
6. Principals of Engineering Metrology (*Rega Rajendra*) Jaico. Publication
7. Measurement Systems (Applications and Design) 5th ed.- (*E.O. Doebelin*)–McGraw Hill.
8. Dimensional Metrology, (*Connie Dotson*), CENGAGE Learning
9. Mechanical Engineering Measurement (*Thomas Beckwith, N.Lewis Buck, Roy Marangoni*) Narosa Publishing House, Bombay.
10. Mechanical Engineering Measurements (*A.K.Sawhney*)–Dhanpat Rai & Sons. New Delhi.
11. Instrumentation Devices & Systems (*C.S. Rangan & G.R.Sarrna*) Tata McGraw Hill.
12. Instrumentation & Mechanical Measurements (*A.K.Thayal*)
13. Engg. Metrology (*R.K.Jain*)



Theory of Machine –II

T.E. Sem. V [MECH/AUTO]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. Clutches

Positive clutches, friction clutches, Friction Clutches – Analysis of frictional torque, power transmission. Power loss in Friction in single plate, multiple plate clutch and cone clutch, Centrifugal Clutches – construction, working

2. Brakes : Types of Brakes, Analysis of Block brakes – external and internal, Band brake– simple and differential, Band and block brake – simple and differential, Braking of vehicles – front wheels, rear wheels, all wheels on level and inclined roads.

Dynamometers – Absorption and transmission dynamometers, Study and analysis of absorption type dynamometer – Proney brake, Rope brake, dynamometers, study and analysis of transmission type dynamometers – Belt transmission, epicyclical, torsion dynamometers, Froude hydraulic dynamometer.

3. Governors: Comparison between governors and flywheel, Types – centrifugal governors, inertia governors.

Force analysis of gravity loaded governors – Watt, Porter, Proell, Force analysis of spring loaded governors – Hartnell, hartung, Wilson Hartnell, Force analysis of spring and gravity loaded governor, Performance characteristics of governors – stability, sensibility, isochronisms, Hunting, governor effort and governor power, coefficient of insensitiveness.

4. Gyroscope: Introduction

Gyroscopic couple and its effect on spinning bodies, Gyroscopic effect on naval ships during steering, pitching and rolling. Ship stabilization with gyroscopic effect

Two wheeler and four wheeler on curved path – effect of gyroscopic and centrifugal couples, maximum permissible speeds on curve paths, Gyroscopic effect due to lateral misalignment of rigid disc mounted on shaft.

5. Gear Trains

Kinematics and dynamic analysis of – simple gear trains, compound gear trains, reverted gear trains, epicyclic gear trains with spur or bevel gear combination.

Introduction to flexural Mechanism, Rigid link mechanism Vs flexural Mechanism.

6. Cam and Follower, classification, motion analysis and plotting of displacement – time, velocity – time, jerk– time for uniform velocity, UARM, SHM & Cycloid motion (combined motion during one stroke excluded), Motion analysis of simple Cams– R–R Cam, D–D–R Cam operating radial translating follower, Pressure angle & methods to control pressure angle.

References :

1. Dynamics of Machines (*Norton*) McGraw Hill Publication
2. Theory of Mechanisms and Machines (*A Ghosh and A. Malik*) Affiliated East–West Press Pvt.Ltd., New Delhi
3. Theory of Machines (*W.G.Green*) Bluckie & Sons Ltd.
4. Mechanics & Dynamics of Machinery (*J.Srinivas*) Scitech
5. Kinematics, Dynamics and Design of Machinery, 2nd ed., (*Kenneth Waldron, Gary Kinzel*) Wiley India Edition
6. Essential MATLAB for Engineers and Scientist (*Brian D. Hanhn, Daniel Valentine, Elsevier*)
7. Theory of Machines (*Thomas Bevan*) C.B.S. Publishers
8. Theory of Machines (*S.S. Ratan*) Tata McGraw Hill
9. Theory of Machines (*P.L. Ballaney*) Khanna Publishers, Delhi
10. Mechanics of Machines – Elementary Theory and Examples (*J.Hannah and R.C.Stephens*) Arnold International Students Edition.
11. Mechanics of Machines, Advanced Theory and Examples (*J. Hannah and R.C.Stephens*) Arnold International Students Edition.
12. Simulations of machines using MATLAB and SIMULINK (*John Gardener*) Cengage Learning
13. Kinematics and Dynamics of Machinery (*Charles Wilson and Peter Sadler*) Pearson Education



Fluid Mechanics
T.E. Sem. V [MECH/AUTO]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	02(PE)	25
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. Fluid Definition and Properties

Concept of continuum, Newton's law of viscosity, classification of fluid.

Fluid Statics

Definition of body forces and surface forces, static pressure, Pascal's law, Derivation of basic hydrostatic equation, Forces on surfaces due to hydrostatic pressure, Buoyancy and Archimedes Principle.

2. Fluid Kinematics

Understanding of Eulerian and Lagrangian– approach to solutions, Velocity and acceleration in an Eulerian flow field, Definition of streamlines, path lines and streak lines. Definition of steady / unsteady, uniform / non–uniform, one two and three–dimensional flows. Understanding of differential and integral methods of analysis. Definition of a control volume and control surface, types of control volumes.

3. Fluid Dynamics

Equations for the control volume : Integral equations for the control volume; Reynolds transport theorem with proof. Application to mass, energy and momentum transport (linear and angular). Differential equations of the control volume: Conservation of mass (two and three dimensional). Navier – Stokes equations (without proof) for rectangular and cylindrical co–ordinates. Exact solution of Navier – stokes equations: viscous laminar flow of a fluid through a pipe, viscous laminar flow of a fluid through planes (both stationary, one plane moving with a uniform velocity), Fluid flow through concentric cylinders. Euler's equations in two, three dimensions; Bernoulli's equation. Kinetic energy correction factor and momentum energy correction factor.

4. Ideal Fluid Flow Theory

Definition of stream functions and velocity potential functions, rotational and irrotational flows in two dimensions, definition of source, sink, vortex, circulation. Combination of simple flow patterns– e.g. flow past Rankine full body and Rankine half body, Doublet, flow past cylinder with and without circulation, Kutta – Joukowski law.

Real Fluid Flows

Definition of Reynolds number, Turbulence and theories of turbulence – Prandtl's mixing length theory, Eddy viscosity theory, k – epsilon theory. Velocity profiles for turbulent flows: one – seventh power law, universal velocity profile, velocity profiles for smooth and rough pipes, Darcy's equation for head lost in pipe flows, pipes in series and parallel, hydraulic gradient line, Moody's diagram.

5. Boundary Layer Flows

Concept of boundary layer and definition of boundary layer thickness, displacement thickness, momentum thickness, energy thickness. Growth of boundary layer, laminar and turbulent boundary

layers, laminar sub-layer, Von-Karman momentum integral equations for the boundary layers, analysis of laminar and turbulent boundary layers, calculation of drag., separation of the boundary layer and methods to control it, concept of streamlined and bluff bodies. Aerofoil theory: definition of an aerofoil, lift and drag on aerofoils, induced drag.

6. Introduction to Computational Fluid Dynamics

Basic concepts, Basic aspects of discretization. Grids with appropriate transformation, some simple CFD techniques. Finite volume method of analysis, solutions to simple flow problems. Numerical solution by means of an implicit method and pressure correction method.

References :

1. Fluid Mechanics (*Streeter and Wylie*) McGraw Hill
2. Mechanics of Fluid 3rd edition (*Merle Potter, David Wiggert*) Cengage Learning
3. Fundamental of Fluid Mechanics 5th edition (*Munson*) Wiley
4. Fluid Mechanics (*Frank M. White*) McGraw Hill
5. Fluid Mechanics (*Cengel, Yunus, Bhattacharya, Souvik*) McGraw Hill
6. Fluid Mechanics (*K.L. Kumar*)
7. Introduction to Computational Fluid Dynamics (*Niyogi*) Pearson Education
8. An Introduction to Computational Fluid Dynamics The Finite Volume Method 2nd edition (*Versteeg*) Pearson Education
9. Introduction to Fluid Mechanics 5th edition (*Fox*) Wiley
10. Introduction to Fluid Mechanics, (*Shaughnessy*) et al, Oxford
11. Introduction to Fluid Mechanics and Fluid Machines 2nd ed., Tata McGraw Hill
12. Fluid Mechanics (*Yunus Cengel and John Cimbala*) Tata McGraw Hill.
13. Advanced Fluid Dynamics (*Muralidhar and Biswas*)
14. Fluid Mechanics (*Douglas*) et.al. 5th, Pearson Education
15. Computational Fluid Dynamics (*John Anderson*) McGraw Hill
16. Fluid Mechanics with Engineering Applications (*John Finnemore, Joseph Franzini*) McGraw Hill
17. 1000 Solved Problems in Fluid Mechanics (*K. Subramanya*) Tata McGraw Hill



Heat and Mass Transfer

T.E. Sem. V [MECH/AUTO]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	3 Hrs.	100
Practical Exam	–	–
Oral Exam	–	25
Term Work	–	25

SYLLABUS

1. Conduction

Mechanism of heat transfer by Conduction. Fourier's three-dimensional differential equation for Conduction with heat generation in unsteady state in the Cartesian co-ordinates. Solution of Fourier's equation for one-dimensional steady state Conduction through isotropic materials of various configurations such as plane wall, plane composite wall, cylindrical and spherical composite walls. (For cylindrical and spherical walls, derivation of Fourier's three-dimensional equation is NOT included.)

- Unsteady state Conduction through a plane wall having no internal resistance. Users of Heisler charts. Extended surfaces. Solutions for heat transfer through rectangular fins. Types of fins and their applications. Effectiveness and efficiency of fins.

3. Convection

Mechanism of heat transfer by convection. Natural and Forced convection. Hydrodynamic and thermal boundary layers. Similarity between velocity profile and temperature profile. Heat transfer coefficient (film coefficient) for Convection. Effect of various parameters such as physical properties of the fluid, system geometry, fluid flow etc. on heat transfer coefficient. Heat pipe- Introduction and application. Principle of dimensional analysis. Application of dimensional analysis to Convection for finding heat transfer coefficient. Empirical relations for Convection. Physical significance of dimensionless numbers such as Nusselt's Number, Grashoff's Number, Prandtl's Number, Reynolds Number and Stanton's Number. Reynolds analogy between momentum and heat transfer. 2.8. Heat transfer in condensation. Nusselt's theory of laminar film Condensation. Heat transfer in boiling Curve & critical heat flux.

4. Radiation

Mechanism of heat transfer by Radiation. Concept of black body and grey body. Emissive power and Emissivity. Basic laws of Radiation: Planck's law, Kirchoff's law, Stefan – Boltzman law, Wien's-displacement law and Lambert's Cosine law. Intensity of Radiation Radiosity. Radiation heat exchange between two black bodies. Electrical network analogy for radiation heat exchange between two and three grey bodies. Shape factor for simple geometries. Properties of shape factor.

5. Heat Exchangers

Classification of heat exchangers. Logarithmic Mean Temperature Difference, Correction factor and effectiveness of heat exchangers. Effectiveness as a function of Number of Transfer Units and heat capacity ratio. Overall heat transfer coefficient, Fouling factor.

6. Mass Transfer

Mechanism of mass transfer. Importance of mass transfer in engineering. Fick's law of diffusion. Steady State diffusion of gases and liquids through plane, cylindrical and spherical walls. Equimolar diffusion. Isothermal evaporation of water into air. Convective mass transfer and mass transfer coefficient. Empirical relations for mass transfer, in terms of Sherwood Number, Reynolds Number and Schmidt's number.

References:

1. Elements of Heat Transfer (*Jakole and Hawkins*)
2. Heat Transfer (*James Sucec*) JAICO Publishing House
3. Heat Transfer (*Donald Pitts & L.E. Sisson Schaums Series*) McGraw Hill International
4. Engineering Heat Transfer (*James R. Weity*)
5. Engineering Heat Transfer (*Shao Ti Hsu*)
6. Heat and Mass Transfer (*Eckert and Drake*)
7. Heat Transfer (*M.Necati Ozisik*) McGraw Hill int. education
8. Heat Transfer (*Incropera and Dewitt*) Wiley India
9. Fundamentals of Momentum, Heat and Mass Transfer 4th ed. (*Welty*) Wiley India
10. Engineering Heat Transfer N.V.Suryanarayana Penram publication
11. Heat Transfer (*S.P. Sukhatme*) University Press
12. Heat Transfer (*Ghosdastidar*) Oxford University press.
13. Heat Transfer 9th ed. (*J.P.Holman*) McGraw Hill
14. Principles of Heat Transfer 6th ed., (*Frank Kreith*) CENGAGE Learning
15. Heat and Mass Transfer (*C.P.Arora*) Dhanpatrai and Co.
16. Heat and Mass Transfer (*Prof. Sachdeva*)
17. Heat and Mass Transfer (*R. Yadav*)
18. Heat Transfer (*Y.V.C. Rao*) University Press
19. Heat and Mass Transfer (*R.K.Rajput*) S.Chand & Company Ltd.
20. Fundamentals of Heat and Mass Transfer Incropera Wiley India
21. Heat and Mass Transfer (*Domkundwar*) Dhanpatrai and Co.
22. Heat and Mass Transfer 2nd ed. (*Nag P.K.*) Tata McGraw Hill
23. Introduction to Thermodynamics and Heat Transfer with ESS Software 2nd ed. (*Yunus A. Cengel*)
McGraw Hill International
24. Fundamentals of Heat and Mass Transfer (*Thirumaleshwar*) Pearson Education



Graphic User Interface and Database Management

T.E. Sem. V [MECH]

EVALUATION SYSTEM

	Time	Marks
Theory Exam	–	–
Practical Exam	04(PE)	50
Oral Exam	–	50
Term Work	–	50

SYLLABUS

1. GUI

Murphy's Law of GUI Design, Features of GUI, Icons and graphics, Identifying visual cues, clear communication, color selection, GUI standard, planning GUI Design Work. Goal Directed Design, Software design, Visual Interface design, Menus, Dialog Boxes, Toolbars, Gizmo- laden dialog boxes, Entry gizmos, extraction gizmos, visual gizmos.

Visual programming; Software Component Mindset-role of programming code.

2. VB. Net

Building objects : Understanding objects, building classes, reusability, constructor, inheritance the frame work classes.

Advanced Technique : Building a favorites viewer using shared properties and methods, understanding OOP and memory management Building class libraries:- Understanding class libraries, Using strong names, Registering assemblies, Designing class libraries.

Creating your own custom controls : Windows forms control, Exposing properties from user control, Inheriting control behavior, Design time or run time, Creating a Form Library.

Accessing Database : Data Access components, Data Binding.

Database Programming : ADO.NET, The ADO.NET Classes in action, Data Binding – Unit References. BVB.Net

3. Data base concepts and Systems

Introduction : Purpose of Database Systems, Views of data, Data Models, database language, Transaction Management, Storage Management, Database Administrator, Database Users, Overall System Structure, Different types of Database Systems.

4. E–R Model : Basic Concepts, Design Issues, Mapping Constraints, Keys, E–R Diagram, Weak Entity set, Extended E–R features, Design of an E–R Database Schema, Reduction of an E–R schema to Tables.

Relational Model : Structure of Relational Database, The Relational Algebra, The tuple relational calculus, The Domain Relational Calculus, Views.

5. SQL : background, Basic Structure, SET operations, Aggregate functions, Null Values, Nested Sub queries, Derived Relations, Views, Modification of Database, Joined Relations, DDL, other SQL features.

Transaction : Transaction Concepts, State, Implementations of Atomicity and durability, Concurrent Executions, Serializability, Recoverability, Transaction Definition in SQL.

Concurrency Control : Lock based protocol, Timestamp based protocol, Validation based protocol, Multiple Granularity, Multi version Schemes, Deadlock Handling, Insert and Delete operations, Concurrency in index structure.

6. SQL SERVER

SQL Server Database Architecture- physical Architecture- logical Architecture

SQL Server administration tasks and tools – The SQL Server Enterprise Manager

Security and user administration, SQL Server Command – Line utilities, Database Maintenance Data base design and performance.

References:

1. Using visual basic 6 / (*Reselman, Rob: Peasjey, R.Pruchniak*) Prentice Hall India Pvt. Ltd.,
2. Visual Basic 6: In Record Time/ (*Brown*), S.B P B Publication
3. SQL Server 2000 Black Book (*Patrick Dalton, Paul Whitehead*) dreamtech press
4. Beginning SQL Server 2000 for Visual Basic Developers Willis thearon Shroff publishers
5. An Introduction to Database System (*C.J. Date*)
6. Principles of Database System, (*Ullman*), Galgotia Publications
7. Database Management Systems (*Majumdar / A K Bhattacharyya*) Tata Mc Graw Hill
8. Object Oriented MultiDatabase System (*Omran A. Bukhares & A.K. Elmagarmid*) Prentice Hall
9. Database Systems and Concepts, (*Henry F. Korth, Sliberschatz, Sudarshan*) McGraw Hill
10. DBMS by Date
11. Visual Basic 6 Programming Bible (*Eric Smith*) IDG Books India Pvt. Ltd.
12. Visual Basic 6 Programming Black Book (*Steven Holzner*) IDG Books India
13. GUI Design for dummies, IDG books.
14. The Essentials of User interface Design, (*Alan Cooper*) IDG Books India
15. SQL Server 2000 Black gook (*Patrick Dalton*) IDG Books India Pvt.
16. Visual Basic 6 Programming Blue Book by (*Peter G. Aitken*) Technology Press
17. Microsoft SQL Server 7.Q Bjeletich S.: (*Mable G. Techmedia*)

