

SEMESTER-III

SECOND YEAR DIPLOMA
ENGINEERING AND TECHNOLOGY
MECHANICAL ENGINEERING GROUP

MSBTE's
I
SCHEME

ENGINEERING METROLOGY



VINOD THOMBRE-PATIL

 **NIRALI**
PRAKASHAN

A Text Book Of

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(22342)

Semester - III

SECOND YEAR DIPLOMA IN MECHANICAL ENGINEERING

As Per MSBTE's 'I' Scheme Syllabus

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Dedication ...

In the loving memory of my Father,

**Late Mr. S. T. Thombre – Patil,
Hon'ble Advocate, Jalna**

Thanks to my Wife,

**“Mrs. Apeksha Vinod Thombre – Patil,
(M.E. EXTC),
Asst. Professor”**

and Beloved Son,

“Abhishek”

Preface . . .

I am glad to present the book entitled "Engineering Metrology" for IInd Year (Third Semester) Diploma in Mechanical Engineering as per the "I" Scheme code syllabus prescribed by MSBTE.

I have observed the students facing extreme difficulties in understanding the basic principles and fundamental concepts without adequate solved problems along with the text. To meet this basic requirement of students, sincere efforts have been made to present the subject matter with frequent use of figures and lots of numerical examples.

I am thankful to Mr. Dineshbhai Furia, Mr. Pradeepbhai Furia, Mr. Jigneshbhai Furia, Mr. Shashikant Patel, Mr. Malik Shaikh, Mrs. Manasi Pingle, Mrs. Anjali Muley, Ms. Chaitali Takle, Mr. Ravindra Walodare of Nirali Prakashan along with their staff members for bringing this publication timely to the Market.

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I specially thank my students for motivating and encouraging me from time to time.

Any errors or suggestions for the improvement of this book brought to notice will be thankfully acknowledged and incorporated in the next edition.

Vinod Thombre - Patil

Syllabus ...

Unit 1 - Introduction to Metrology (Marks 10, Hours 06)

- 1.1 Definition of Metrology, Objectives of Metrology
- 1.2 Categories of Metrology, Scientific Metrology, Industrial Metrology, Legal Metrology
- 1.3 Need of Inspection, Precision, Accuracy, Sensitivity, Readability, Calibration, Traceability, Reproducibility
- 1.4 Sources of Errors, Factors Affecting Accuracy
- 1.5 Selection of Instrument, Precautions while using an Instruments for getting Higher Precision and Accuracy
- 1.6 Concept of Least Count of Measuring Instrument

Unit 2 - Standards and Comparators (Marks 10, Hours 10)

- 2.1 Definition and Introduction to Line Standard, End Standard, Wavelength Standard and their Comparison.
- 2.2 Slip Gauge and Its Accessories.
- 2.3 Definition and Requirement of Good Comparator, Classification, Use of Comparators.
- 2.4 Construction and Working Principle of Comparators - Dial Indicator, Sigma Comparator, Pneumatic Comparator - High Pressure Differential Type.
- 2.5 Relative Advantages and Disadvantages.

Unit 3 - Limits, Fits, Tolerances and Gauges (Marks 12, Hours 08)

- 3.1 Concepts of Limits and Fits, Deviation and Tolerances
- 3.2 Basic Terminology, Selective Assembly, Interchangeability
- 3.3 Indian Standard (IS 919-1993) Fits, Types of Fits, Hole and Shaft Basis System, Guide for Selection of Fit
- 3.4 ISO System of Limit and Fit, (Numerical on finding the Limit and Tolerances of Hole and Shaft Assembly)
- 3.5 Gauges: Limit Gauges, Taylors Principle of Gauge Design Plug, Ring Gauges, Snap Gauge, Adjustable Snap Gauge

Unit 4 - Screw Thread Measurements and Gear Measurement (Marks 12, Hours 08)

- 4.1 Screw Thread Terminology, Errors in Threads and Pitch
- 4.2 Measurement of Different Elements such as Major Diameter, Minor Diameter, Effective Diameter, Pitch Diameter, Best Size of Wire, Two Wire Method, Thread Gauge Micrometer
- 4.3 Working Principle of Floating Carriage Micrometer
- 4.4 Introduction to Tool Maker's Microscope, Applications and Working Principle

Gear Measurement

- 4.5 Analytical and Functional Inspection of Gear, Measurement of Tooth Thickness by Constant Chord Method and Base Tangent Method by Gear Rolling Tester/Parkinson's Gear Tester.
- 4.6 Measurement of Tooth Thickness by Gear Tooth Vernier and Profile Projector Errors in Gears such as Backlash, Run Out.

Unit 5 - Linear and Angular Measurement (Marks 12, Hours 08)

- 5.1 Concept of Linear Measurement and Its Instruments: Surface Plate, V-block, Calipers, Combination Set, Depth Gauge, Vernier Instruments, Micrometer Instruments, Slip Gauges.
- 5.2 Concept of Angular Measurement
- 5.3 Instruments for Angular Measurements
- 5.4 Use and Working of Universal Bevel Protractor, Sine Bar, Spirit Level
- 5.5 Principle of Working of Clinometers, Angle Gauges (With Numerical on Setting of Angle Gauges), Angle Dekkor as an Angular Comparator

Unit 6 - Other Measurements (Marks 14, Hours 08)

- 6.1 Primary and Secondary Texture, Terminology of Surface Texture as per IS 3073-1967, CLA, R_a, RMS, R_z Values and their Interpretation, Symbol for Designating Surface Finish on Drawing
- 6.2 Various Techniques of Qualitative Analysis, Working Principle of Stylus Probe Type Instruments, Surface Roughness Tester, Interferometry
- 6.3 Parallelism, Straightness, Squareness, Roundness, Run out, Alignment Tests of Lathe and Drilling, Machine Tools as per IS Standard.
- 6.4 Flatness Testing using Monochromatic Light Source with Optical Flat, Introduction to CMM.

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