

MFPC3001 METROLOGY AND INSPECTION (3-0-0)

Course Objectives:

This course introduces fundamental and advanced metrology concepts, covering measurement principles, standards, and inspection techniques. Students will learn about surface roughness measurement, geometric tolerances, interferometry, and computer-aided inspection (CMM, laser metrology). Emphasis is placed on accuracy, calibration, and modern inspection technologies for quality assurance in manufacturing.

Module-I: (08 Hours)

Concepts of Metrology: Principles of Measurements, Line and End Standards, Calibration, accuracy and Precision, Random error and systemic error, Measurement of Surface Roughness, Screw Thread and Gears, Limits, Fits and Gauges, Assembly by full, partial and group interchangeability, geometric tolerances, Measurement of straightness, Flatness and circularity.

Module-II: (06 Hours)

Terminologies - Standards of measurement - Line and End & optical Standards - Errors in measurement - Interchangeability and Selective assembly - Accuracy and Precision-Calibration of instruments - Basics of Dimensional metrology and Form metrology.

Module-III: (06 Hours)

Measurement of Surface Roughness: Definitions - Types of Surface Texture: Surface Roughness Measurement Methods- Comparison, Contact and Non-Contact type roughness measuring devices, 3D Surface Roughness Measurement, Nano Level Surface Roughness Measurement-Instruments.

Module-IV: (05 Hours)

Interferometry: Introduction, Principles of light interference Interferometers Measurement and Calibration Laser Interferometry.

Module-V: (05 Hours)

Computer Aided and Laser Metrology: Tool Makers Microscope, Coordinate Measuring Machines - Applications Laser Micrometer, Laser Scanning gauge, Computer Aided Inspection techniques - In-process inspection, Machine Vision system- Applications.

Course Outcomes:

- CO1: Remembering (Knowledge): Define metrology terms (accuracy, precision, interchangeability) and recall measurement standards (line, end, optical).
- CO2: Understanding (Comprehension): Explain surface roughness parameters, geometric tolerances, and interferometry principles.
- CO3: Applying (Application): Use instruments (CMM, laser micrometer) for dimensional and form metrology in practical scenarios.
- CO4: Analyzing (Analysis): Evaluate measurement errors and select appropriate techniques for surface roughness (contact/non-contact methods).
- CO5: Creating (Synthesis): Design inspection protocols integrating computer-aided and laser metrology for quality control in production.

Text Books

1. Engineering Metrology, R.K. Jain, Khanna Publisher, Delhi.
2. A text book of Engineering Metrology I.C. Gupta, Dhanpat Rai & sons, Delhi.
3. Whitehouse, D.J., "Surface and their measurement", Hermes Penton Ltd, 2004