311081: Metrology and Quality Assurance

Teaching Scheme	Credit Scheme	Examination Scheme
Lectures: 3 hours / week	Theory: 03	In-Sem: 30 Marks End-Sem : 70 Marks

Prerequisites:

- Basic knowledge of Engineering drawing, Machine drawing, Dimensioning and tolerances, various geometrical features.
- Various manufacturing processes and their capabilities, correlation between operating parameters and process responses.
- Basic knowledge of standard machine tools such as: Lathe, Drilling machine, Milling Machine, etc.
- Basic knowledge of standard machine components such as: Gear, spring, Screw threads etc.

Course objectives:

To impart students knowledge of theoretical and practical aspects of measurement standards, measuring instruments and their construction, working and applications. This subject also exposes the students to the principles of measurement, gauges and concepts of quality assurance and their practical use.

Outcomes:
After learning this subject, the student will:

- be able to describe and work with various linear and angular measuring devices
- beable to design limit gauges and work with special measuring devices for gear, screw thread and surface finish measurements
- beable to distinguish various comparators and use profile projector
- beable to use various control charts and various quality assurance tools
- get knowledge of various quality standards and their implementations in industries.
- be able to implement TQM and TPM concepts in practice

Unit I **(8)**

Introduction: Meaning of Metrology, Precision, Accuracy, Errors in Measurement,Calibration.
Linear Measurement: Standards, Classification of Standards, Precision and Non Precision Measuring instrument, Slip Gauges. Manufacturing of slip gauges
Angular Measurement: Sine bar, Sine Center, Uses of sine bars, angle gauges, Auto Collimator Angle Dekkor.
Inspection of Geometric parameters: Straightness, flatness, Parallelism, Concentricity, Squareness and Circularity. Alignment testing- lathe/milling/ drilling m/c
Comparators: Uses, Types, Advantages and Disadvantages of various Comparators.

Unit II **(8)**

Limits, Fits and Tolerances: Meaning of Limit, Fits and Tolerance, Cost -Tolerance relationship, concept of Interchangeability, selective assembly, Indian Standard System. Design of limits
Gauges: Types, Uses, Taylor's Principle, Design of Limit Gauges, Introduction to auto gauging systems.
Interferometry: Introduction, Flatness testing by interferometry, NPL Interferometer.

Unit III (8)

Surface Finish Measurement: Surface Texture, methods of evaluation of surface roughness, Grades of Roughness, Specifications, Tomlinson's Surface Recorder, Taylor- Hobson Surface Meter and Talysurf for measuring all characteristics of surface texture.

Screw Thread Metrology: External Screw Thread terminology, effective diameter measurement methods, Pitch and flank Measurement of External Screw Thread, Application of Tool Maker's Microscope, Use of Profile Projector.
Gear Metrology: Spur Gear Parameters, Gear tooth thickness measurement: Gear tooth Vernier caliper, Constant chord method, Span Micrometer, Base tangent method.

Recent Trends in Engineering Metrology-Universal measuring machine coordinate measuring machine, laser interferometer.

Unit IV (8)

Introduction to Quality
Meaning of Quality, Quality of Product, Quality of Service, Cost of Quality, Value of Quality, Role of Quality in Present day environment. Introduction to Statistical Quality Control: Control Charts, X, R, P and C Charts, Sampling inspection, OC Curves and Sampling Plans, Process Capability Index (PCI), Concept, Methods of determining PCI and uses of PCI.

Unit V (8)

Quality Assurance tools and techniques
Total quality management (T.Q.M):- Approaches-Deming's Approach,Juran's Approach, , Seven quality tools and new seven quality toolsQ.F.D., Quality Circles, Kaizen, six sigma, T.P.M. Technical Specification (T.S) TS 16949 Standards.

Unit VI (8)

Quality Standards
ISO 9001-2000 Series of Standards- History and Evolution ofISO 9000Series, importance and overview of ISO 9000- 1998 Series standards, structure of ISO 9000-2000 Series standards, clauses of ISO 9000 series standards and their interpretation and implementation, quality system documentation and audit.
ISO 14000:- Environmental management concepts, and requirement of ISO 14001, benefit of Environmental Management Systems, Environmental, Health and Safety standards.

Text Books:

1. K.J.Hume, "Engineering Metrology", Kalyani publi cation ISBN8170290015
2. K.W.B.Sharp, "Practical Engineering Metrology", Pitman Publication
3. F. M. Gryna, R. Chua & J. Defco, "Jurans Quality Planning and Analysis for Enterprise Quality", McGraw Hill series. ISBN0070618488

ReferenceBooks:

1. R.K. Jain, "Engineering Metrology", Khanna Publication.
2. I.C.Gupta, "A Text book of Engineering Metrology", Dhanpat Rai and Sons.
3. Kaoru Ishikawa, "Guide to Quality Control", Asian Productivity Organisation, Series,
4. Juran's Quality Handbook