

ME285: Metrology and Quality Control

Teaching Scheme			Credits C	Marks Distribution				Total Marks
L	T	P		Theory Marks		Practical Marks		
				ESE	CE	ESE	CE	
3	0	2	5	70	30	30	20	150

Course Content:

Sr. No.	Topics	Teaching Hrs.
1	<p><u>Principle of Engineering Metrology:</u></p> <p>Introduction to metrology, standards of measurement, terminology of measurement, accuracy and precision, measuring errors, abbe's principle of alignment, general care of measuring instruments.</p>	02
2	<p><u>Linear measurements:</u></p> <p>Need for linear measurement, Least count, linear measuring instruments-engineer's steel rule, Callipers ,datum and reference surfaces, surface plates, vee block, combination set, gauges, Vernier caliper, Vernier height gauge, Vernier depth gauge, Micrometers, Bore gauge, Telescopic gauge, Slip gauges, length bars, calibration of linear measuring instruments.</p>	02
3	<p><u>Comparators:</u></p> <p>Need for a comparator, some design considerations, brooke's level , eden-rolt Millionth comparator, mechanical Comparators, Optical Comparators, Electrical Comparators, Pneumatic Comparators.</p>	04
4	<p><u>Geometric Features:</u></p> <p>Straightness, flatness, squareness, parallelism, circularity, roundness.</p>	02
5	<p><u>Angular measurements:</u></p> <p>Angular measuring instruments: Protractors, Sine bars, Sine center, Angle gauges, Spirit level, Clinometers, autocollimator, Angle dekkor, Measurement of taper shafts and holes.</p> <p>Taper measurement and radius measurement.</p>	02

6	<u>Metrology of Gears and Screw threads:</u>	04
	Measurement of tooth thickness: Gear tooth vernier, Constant chord method, Addendum comparator method and Base tangent method, Measurement of tooth profile: Tool maker's microscope or projector, Involute tester, Measurement of pitch, Measurement of run out, Lead and Backlash checking. Measurement of concentricity, Alignment of gears.	
	Screw Thread Measurement: Errors in threads, screw thread gauges, measurement of element of the external and internal threads, thread calliper gauges.	
7	<u>Metrology of Surface finish:</u>	04
	Surface Metrology Concepts and terminology, Analysis of surface traces, Specification of surface Texture characteristics, and Method of measuring surface finish: Stylus system of measurement, Stylus probe instruments, Wave length, frequency and cut off, other methods for measuring surface roughness: Pneumatic method, Light Interference microscopes, Mecrin Instruments.	
8	<u>Introduction to Quality Control:</u>	05
	Definition of quality, Basic concept of quality, definition of SQC, benefits and limitation of SQC. Comparison of Inspection, Quality control and Quality assurance, concept of quality cost, seven quality control tools and its application, 7 New Quality Improvement Tools and its application.	
9	<u>Process Control for Variables and Attributes:</u>	06
	Causes of Variation, Control Charts for Variables, Control Chart Patterns and Corrective Actions, Control Charts for Attributes.	
10	<u>Acceptance Sampling:</u>	04
	Lot by lot sampling, probability of acceptance in single, double, multiple sampling techniques. OC curves – producer's Risk and consumer's Risk. AQL, LTPD, AOQL concepts-standard sampling plans for AQL and LTPD- uses of standard sampling plans. Process Capability, Process Capability ratio and Process Capability Index.	

Introduction to Concurrent Engineering, Quality Function Deployment (QFD), six sigma , lean manufacturing and Failure Mode and Effect Analysis (FMEA)–Concept, Methodology ,Implementation and Application

Total Hrs. 40

Reference Books:

1. I C Gupta, “*Engineering Metrology*”, Dhanpat Rai Publications.
2. R K Jain, “*Engineering Metrology*”, Khanna Publishers-Delhi.
3. J F W Gayler and Charles R Schotbolt, “*Metrology for Engineers*”, Cengage Learning EMEA; 5th Revised edition.
4. Douglas C Montgomery, “*Statistical Quality Control*”, John Wiley & sons.
5. B. L. Hanson and P. M. Ghare, “*Quality Control & Application*”, Prentice Hall of India, 2009.
6. Mitra Amitava, “*Quality Control and Improvement*”, 3/e, John Wiley & Sons, 2003.
7. M. Mahajan, “*Statistical Quality Control*”, Dhanpat Rai & Co. (P) Ltd.
8. Dale H. Besterfield, Carol Besterfield-Michna, Glen H. Besterfield and Mary Besterfield-Sacre, “*Total Quality Management*” , 3/e, Pearson Education, 2011.