GUJARAT TECHNOLOGICAL UNIVERSITY

Master of Engineering
Subject Code: 3732809
Semester – III
Subject Name: Metrology and computer Aided Inspection

Type of course: Program Elective V

Prerequisite: Nil

Rationale:
The purpose of this course is to teach the students basic concepts in various methods of engineering measurement techniques and applications, understand the importance of measurement and inspection in manufacturing industries. This will also make the students capable of learning to operate and use advanced metrological devices with ease in industrial environments.

Teaching and Examination Scheme:

Teaching Scheme			Credits	Examination Marks				Total Marks
				Theory Marks		Practical Marks		
L	T	P	C	ESE (E)	PA (M)	ESE (V)	PA (I)	
3	0	0	3	70	30	0	0	100

Content:

Sr. No.	Content	Total Hrs
1	**Concepts of Metrology:** Terminologies, Standards of measurement, Errors in measurement, Interchangeability and Selective assembly, Accuracy and Precision, Calibration of instruments, Basics of Dimensional metrology and Form metrology	08
2	**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.	10
3	**Interferometry:** Introduction, Principles of light interference, Interferometers, Measurement and Calibration, Laser Interferometry.	08
4	**Computer Aided and Laser Metrology:** Tool Makers Microscope, Microhite, Coordinate Measuring Machines, Applications, Laser Micrometer, Laser Scanning gauge, Computer Aided Inspection techniques, In-process inspection, Machine Vision system-Applications.	10
5	**Image Processing for Metrology:** Overview, Computer imaging systems, Image Analysis, Preprocessing, Human vision system, Image model, Image enhancement, gray scale models, histogram models, Image Transforms - Examples.	09

	Total Hours	45

Suggested Specification table with Marks (Theory):

Distribution of Theory Marks					
R Level	U Level	A Level	N Level	E Level	C Level
10	**10**	**30**	**30**	**10**	**10**

Legends: R: Remembrance; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create and above Levels (Revised Bloom's Taxonomy)

Note: This specification table shall be treated as a general guideline for students and teachers. The actual distribution of marks in the question paper may vary slightly from above table.

Reference Books:

1. Bewoor, A.K. and Kulkarni,V.A.,"Metrology and Measurement", Tata Mc Graw-Hill, 2009.
2. Galyer, F.W. and Shotbolt, C.R., "Metrology for engineers", ELBS, 1990.
3. Smith,G.T., "Industrial Metrology", Springer, 2002
4. Whitehouse,D.J., "Surface and their measurement", Hermes Penton Ltd, 2004.
5. "ASTE Handbook of Industries Metrology", Prentice Hall of India Ltd., 1992.
6. Rajput,R.K., "Engineering Metrology and Instrumentations", Kataria & Sons Publishers, 2001.
7. Sonka,M., Hlavac,V. and Boyle.R., "Image Processing, Analysis, and Machine Vision", Cengage-Engineering, 2007.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Understand the advanced measurement principles with ease.	30
CO-2	Operate sophisticated measurement and inspection facilities.	40
CO-3	Design and develop new measuring methods	30

Term Work: Nil

List of Experiments: Nil

Major Equipment: Nil

List of Open Source Software/learning website:

1. The concerned faculty member shall provide the list of peer reviewed Journals and Tier-I and Tier-II Conferences relating to the subject (or relating to the area of thesis for seminar) to the students in the beginning of the semester.
2. NPTEL