Lok Jagruti Kendra University
University with a Difference

Diploma
in
Automobile Engineering

LJ Polytechnic

Course Code: 025010405

Engineering Measurement & Quality Control

Programme / Branch Name	Automobile Engineering					
Course Name	Engineering Measurement & Quality Control				**Course Code**	025010405
Course Type	HSSC	BSC	ESC	PCC	OEC	PEC

Legends: HSSC: Humanities and Social Sciences Courses BSC: Basic Science Courses
ESC: Engineering Science Courses PCC: Program Core Courses
OEC: Open Elective Courses PEC: Program Elective Courses

1. Teaching and Evaluation Scheme

Teaching Hours / Week					**Evaluation Scheme**				
L	**T**	**P**	**Total Teaching Hours**	**Total Credit**	**CA**	**CCE**	**SEE (TH)**	**SEE (PR)**	**Total**
2	0	2	4	3	10	40	50	50	150

Legends: L: Lectures T: Tutorial P: Practical
CA: Continuous Assessment (Attendance + Activity)
CCE: Continuous & Comprehensive Evaluation
SEE (Th): Semester End Evaluation (Theory)
SEE (Pr): Semester End Evaluation (Practical)

2. Prerequisite

- ✓ Physics

3. Rationale

- ✓ The Automobile Engineering technician often come across measuring different parameters of machined components and the appropriate fitment of interchangeable components in the assemblies. For the above purpose he/she is also required to analyze the quantitative determination of physical magnitude and ensure the control of quality.

4. Objectives

- ✓ Identify techniques to minimize the errors in measurement
- ✓ Identify methods and devices for measurement of length, angle, and gear and thread parameters, surface roughness and geometric features of parts.
- ✓ Choose limits for plug and ring gauges.
- ✓ Explain methods of measurement in modern machineries
- ✓ Select quality control techniques and its applications
- ✓ Plot quality control charts and suggest measures to improve the quality of product and reduce cost using Statistical tools.

5. Contents

Unit No.	Unit Name	Topics	Learning Outcome	% Weightage	Hours
1.	**Basic Principles of Measurement**	1.1 Definition of Engineering Measurement. 1.2 International System of Units. 1.3 General Measurement System. 1.4 Methods of Measurement. 1.5 Basic Terminologies for Principles of Measurement. 1.6 Introduction to Errors. 1.7 Types of Errors in Mechanical Measurement.	• Understanding of basics of Measurement and General Measurement system. • Learn to identify various errors. • Understanding basic principles and terminologies in Engineering Measurement.	10	05
2.	**Linear Measurement**	2.1 Concept of Least Count of Measuring Instruments 2.2 Introduction to Linear Measurement 2.3 Classification of instruments used for linear measurement. 2.4 Constructional and functional details of linear measuring instruments: • Vernier Caliper • Micrometer Screw Gauge • Telescopic Bore Gauge • Vernier Height Gauge	• Understanding the least count of various linear measuring instruments. • Understanding the constructional and functional details of various linear measuring Instruments.	25	12
3.	**Angular Measurement**	3.1 Introduction to Angular Measurement 3.2 Instruments for Angular Measurement 3.3 Constructional and functional details of Universal Bevel Protractor 3.4 Constructional and functional details of Spirit Gauge 3.5 Constructional and functional details of Sine Bars	• Understanding the least count of various angular measuring instruments. • Understanding the constructional and functional details of various angular measuring Instruments.	20	08

		3.6 Use of Sine Bar to Measure Angle of Component			
4.	**Temperature, Pressure and Flow Measurement**	4.1 Classification, working principle, construction, working, advantages, limitations & applications of temperature measuring devices. • Thermocouple • Pyrometers 4.2 Classification, working principle, construction, working, advantages, limitations & applications of pressure measuring devices • Bourdon tube pressure gauge • Diaphragm type pressure gauge. 4.3 Classification, working principle, construction, working, advantages, limitations & applications of flow measuring devices • Pitot tube • Orifice meter • Rotameter	• Understanding construction and working of various temperature measuring instruments • Understanding construction and working of various pressure measuring instruments. • Understanding construction and working of various flow measuring instruments.	25	10
5.	**Quality Control**	5.1 Quality &Factors Affecting Quality of Product 5.2 Quality Characteristics and Quality Specification 5.3 Types of Specifications 5.4 Quality Control and Factors affecting Quality Control 5.5 Quality Inspection and Types of Quality Inspection. 5.6 7'Q' for Quality Control 5.7 Six Sigma and Total Quality Management. 5.8 Statistical Quality Control and its advantages.	• Understanding Quality Control and Statistical Quality Control in Industrial Environment.	20	07
				Total Hours	**42**

6. Suggested Specification Table for Evaluation Scheme

Unit No.	Chapter Name	Distribution of Topics According to Bloom's Taxonomy					
		R %	U %	App %	C %	E %	An %
1.	Basic Principles of Measurement	40	20	10	0	10	20
2.	Linear Measurement	25	50	0	0	0	25
3.	Angular Measurement	20	50	20	0	10	0
4.	Temperature, Pressure and Flow measurement	40	20	10	0	10	20
5.	Quality Control	20	50	10	0	0	20

Legends: R: Remembering U: Understanding
App: Applying C: Creating
E: Evaluating An: Analyzing

7. List of Practicals / Exercises

Sr. No	Practical / Exercises	Key Competency	Hours
1	Demonstrate construction and working of vernier caliper	Identify different parts of vernier caliper. Calculate least count of vernier caliper. Identify errors of vernier caliper. Measure outer diameter, inner diameter and depth by vernier caliper of given component.	2
2	Demonstrate construction and working of outside micrometer screw gauge	Identify different parts of outside micrometer screw gauge. Identify errors of outside micrometer screw gauge. Calculate least count of outside micrometer screw gauge. Measure outer diameter of the given component.	2
3	Demonstrate construction and working of telescopic bore gauge	Identify different parts of telescopic bore gauge. Identify errors of telescopic bore gauge. Calculate least count of telescopic bore gauge. Measure bore of the given component.	2
4	Demonstrate construction and working of universal bevel protractor	Identify different parts of universal bevel protractor. Identify errors of universal bevel protractor. Calculate least count of universal bevel protractor. Measure angle by universal bevel protractor	2
5	Demonstrate construction and working of sine bar	Measurement of angle by means of sine bar.	2
6	Demonstrate construction and working of inside micrometer screw gauge	Identify different parts of inside micrometer screw gauge. Identify errors of inside micrometer screw gauge calculate least count of inside micrometer screw gauge. Measure inner diameter of the given component.	2
7	Demonstrate construction and working of bourdon tube pressure gauge and diaphragm type pressure gauge.	Identify parts of bourdon tube pressure gauge and diaphragm type pressure gauge. Identify the errors in pressure gauge and measure the pressure of a closed system.	2
8	Demonstrate construction and working of orifice meter, rotameter and pitot tube.	Identify constructional details and parts of orifice meter, rotameter and pitot tube and measure the flow of a given system.	2
9	Demonstrate construction and working of thermocouple and pyranometers	Identify constructional details and parts of thermocouple and pyranometers and measure the temperature of a given system by means of k-type thermocouple. Also identify the errors in thermocouple	2
10	Demonstrate the concepts of statistical process control in quality management	Role of statistical process control in quality management. Factors affecting quality control and factors affecting quality inspection.	2
		Total Hours	**20**

8. Reference Books

1) Mechanical Measurement and Metrology by Er.R. K Jain, Khanna Publishers (Text Book)
2) Engineering Metrology and Measurement N V Raghavendra and Krishnamurthy, Oxford University Press.
3) Engineering Metrology and Measurements Bentley, Pearson Education.
4) Metrology and Measurement, Anand Bewoor & Vinay Kulkarni McGraw-Hill
5) A Text book of Engineering Metrology, I C Gupta, Dhanpat Rai Publications
6) Industrial Instrumentation & Control by S K Singh, McGrawHill
7) Mechanical Measurement & Control by D.S. Kumar
8) Mechanical Measurements and Instrumentations, Er. R K Rajput, Kataria Publication (KATSON)

9. Open Sources (Website, Video, Movie)

1) https://www.youtube.com/watch?v=vkPlzmalvN4
2) https://www.youtube.com/watch?v=StBc56ZifMs
3) https://www.youtube.com/watch?v=fTvPcWZJmF8&t=19s
4) https://www.youtube.com/watch?v=FDnYzzVrPD8
5) https://www.youtube.com/watch?v=Y2qNBUNWYJQ
6) https://www.youtube.com/watch?v=-oSKiVioFws
7) https://www.youtube.com/watch?v=dgkLbX4cqr4
8) https://www.youtube.com/watch?v=9EsOFiP1J2E
9) https://www.youtube.com/watch?v=rzGPzVBQ00E
10) https://www.youtube.com/watch?v=ELJoieQDe6w
11) https://www.youtube.com/watch?v=3zEdtkuNYLU
12) https://www.youtube.com/watch?v=oUd4WxjoHKY
13) https://www.youtube.com/watch?v=18cN8MZvJRA
14) https://www.youtube.com/watch?v=e5g2NmIUdck
15) https://www.youtube.com/watch?v=NWkFfjJT7ME
16) https://www.youtube.com/watch?v=0x6nHBQXe6w
17) https://www.youtube.com/watch?v=h_jJ5Qp_Wts