



GUJARAT TECHNOLOGICAL UNIVERSITY

Bachelor of Engineering

Subject Code: 3170208

Measurement, Instrumentation and Control in Automobile

BE Semester 7

Type of Course: Under Graduate Level

Prerequisite: Nil

Rationale: Explain the types of measuring systems and their characteristics. The thorough knowledge in mechanical and electromechanical measuring instruments develops the ability to design and judge the use of particular instruments in their industrial exposure. Knowledge in Various experimental techniques develop the design skills of students.

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

Sr No.	Content	Total Hrs
1	Mechanical Measurement: Unit-I Need of mechanical measurement, Basic definitions: Hysteresis, Linearity, Resolution of measuring instruments, Threshold, Drift, zero stability, loading effect and system response. Measurement methods, Generalized Measurement system, Errors and their classification. MEASUREMENT SYSTEMS: - Static and Dynamic Measurement systems, Requirements of measurement such as precision, accuracy, errors, sensitivity, readability and reliability and characteristics,	10
2	Mechanical Measurement: Unit-II Instrumentation for Measuring Weight, Force, torque, pressure, Dynamic Cylinder pressure measurements, power, temperature, fluid flow, vibration, rotational speed , velocity, acceleration and angular motion.	11
3	TRANSDUCERS, MODIFIERS AND TERMINATING DEVICES: Transducers for Automotive Applications, Amplifiers, filters, data Acquisition, Counters, stroboscopes, cathode ray oscillographs. analog and digital type DAS- Indicators, –Signal Analyzing with example of automobile applications	10
4	Sensors: Introduction of sensors and transducers Electromagnetic Sensors, Optical sensors, variable resistance type sensors, temperature sensors, Pressure sensors, variable capacitance sensors, Flow sensors, Piezoelectric sensors, Oxygen Sensor, Practical Importance of sensors	11
5	Actuators: Introduction of Actuators, Actuator's operation, Injectors, Exhaust gas recirculation actuators, motors, Solenoids, ABS actuators.	08



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6	Vehicle power train and motion control Electronic transmission control, adaptive power Steering, adaptive cruise control, safety and comfort systems, anti-lock braking, traction control and electronic stability, active suspension control.	09
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Suggested Specification table with Marks (Theory):

Distribution of Theory % Marks					
R Level	U Level	A Level	N Level	E Level	C Level
26	24	24	26	0	0

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) Engineering Metrology and Measurements, Bentley, Pearson Education
- 2) Mechanical Measurements and Instrumentations, Er. R K Rajput, Kataria Publication (KATSON)
- 3) Mechanical Measurement and Metrology by R K Jain, Khanna Publisher
- 4) Mechanical Measurement & Control by D.S. Kumar
- 5) Instrumentation Devices and systems, Rangan, Sharma and Mani, Tata McGraw Hill Publishing Co., 1990
- 6) Principle of Industrial Instrumentation, D.Patambis , Tata McGraw Hill Publishing Co, New Delhi ,1990
- 7) Engineering Precision Measurement, A.W. Judge, Chapman and Hall Ltd, Essex Street W.C., 1951
- 8) William Ribbens, "Understanding Automotive Electronics", Butterworth Heinemann publication, 2012
- 9) Automotive Computer Controlled Systems by Allan W. M. Bonnick, Butterworth-Heinemann A division of Reed Educational and Professional Publishing Ltd
- 10) U.Kiencke, and L. Nielson, Automotive Control Systems, Springer Verlag Berlin, 2000
- 11) Automotive computers and control system by Tom Weather Jr. & Claid C. Hunter, Prentice Hall Inc., New Jersey.

Course Outcomes:

Sr. No.	CO statement	Marks % weightage
CO-1	Describe fundamental elements of instrumentation, measurement and control systems.	20%
CO-2	Illustrate basic principle of working of sensors, actuator and its application in automotive.	25%
CO-3	Select types of sensor and actuators for automotive application.	25%



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CO-4	Describe methods of measurement for various quantities like force, torque, power, displacement, velocity/seed and acceleration and their calibration methodology.	30%
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List of possible exercise to be performed during semester:

- 1) To study about basic understanding of measurements: concepts, application, advantage and future aspects
- 2) Performance on Temperature measurements and check different characteristics of measurements and also do calibration.
- 3) Performance on Speed/Velocity, acceleration measurements.
- 4) To understand and study of different sensors used in automobile.
- 5) To understand and study of different actuators used in automobile.
- 6) Study of FFT analyzer.
- 7) Study of Static and Dynamic Measurement systems.
- 8) Industrial Visit to an automotive industry or automotive workshop.

List of Open-Source Software/learning website:

1. <http://nptel.ac.in>