

# GUJARAT TECHNOLOGICAL UNIVERSITY

## MECHANICAL (I.C. ENGINE & AUTOMOBILE ENGINEERING) (11)

EXPERIMENTAL TECHNIQUES AND INSTRUMENTATIONS IN AUTOMOBILE  
ENGINEERING

**SUBJECT CODE:** 2711108

**SEMESTER:** II

**Type of course:** Advanced/ Application

**Prerequisite:** - Mechanical Measurement & Instrumentations at under graduate level.

**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 develops the design skills of students. Students can understand the I.S. code for engine testing which will be useful for them in practical field in automotive industries.

**Teaching and Examination Scheme:**

| Teaching Scheme |   |    | Credits | Examination Marks |        |                 |        |    |    | Total Marks |
|-----------------|---|----|---------|-------------------|--------|-----------------|--------|----|----|-------------|
| L               | T | P  |         | Theory Marks      |        | Practical Marks |        |    |    |             |
|                 |   |    | ESE (E) | PA (M)            | PA (V) |                 | PA (I) |    |    |             |
|                 |   |    |         |                   | ESE    | OEP             | PA     | RP |    |             |
| 3               | 0 | 2# | 4       | 70                | 30     | 20              | 10     | 10 | 10 | 150         |

**Content:**

| Sr. No. | Content   | Total Hrs | % Weightage |
|---------|---|-----------|-------------|
| 1.      | <b>Unit-I MEASUREMENT SYSTEMS:</b> - Static and Dynamic Measurement systems, Requirements of measurement such as precision, accuracy, errors, sensitivity, readability and reliability and characteristics, Analysis of experimental detail, Error analysis.  | 7         | 17          |
| 2.      | <b>Unit-II TRANSDUCERS, MODIFIERS AND TERMINATING DEVICES:</b> - Transducers for Automotive Applications, Amplifiers, filters, data Acquisition, Accelerometer, vibration and pressure pickups, vibration test methods, Counters, stroboscopes, cathode ray oscillographs. FFT analyzer, Indicators, Printers and displays, Signal Analyzing. | 6         | 14          |
| 3.      | <b>Unit-III MECHANICAL MEASUREMENT :-</b> Instrumentation for Measuring Weight, Force, torque, pressure, Dynamic Cylinder pressure measurements, power, temperature, fluid flow, vibration, rotational speed , velocity, acceleration and angular motion.   | 8         | 19          |
| 4       | <b>Unit-IV ENGINE EXPERIMENTAL TECHNIQUES:</b> - I.S Code for Engine testing, Instrumentation for performance testing of engine, Instrumentation for Research and development,.   | 6         | 14          |
| 5       | <b>Unit-V WARNING AND ALARM INSTRUMENTS :</b> Brake actuation warning system, flash system, oil pressure warning system, engine over heat warning system, air pressure warning system, speed warning system, door lock indicators, gear neutral indicator, horn design, permanent magnet horn, air & music horns                              | 8         | 19          |

|           |   |          |           |
|-----------|---|----------|-----------|
|           | <b>DASH BOARD AMENITIES :</b> Car radio and stereo, courtesy lamp, time piece, cigar lamp, car fan, wind shield wiper, window washer, instrument wiring system and electromagnetic interference 5suppression, wiring circuits for instruments, electronic instruments, dash board illumination. |          |           |
| <b>6.</b> | <b>Unit-VI VEHICLE EXPERIMENTAL TECHNIQUES :-</b><br>Laboratory tests, test tracks, Endurance Tests, crash tests, wind tunnel tests, Brake tests..  | <b>7</b> | <b>17</b> |

### Reference Books:

1. Engine and Vehicle Testing, J.G. Giles, Illiffe books Ltd., London,1968
2. Mechanical Measurements, T.G. Beckwith and Buck, Oxford and IBH Publishing House, New Delhi ,1995
3. Engineering Precision Measurement, A.W. Judge , Chapman and Hall Ltd, Essex Street W.C , 1951
4. Principle of Industrial Instrumentation , D.Patambis , Tata McGraw Hill Publishing Co, New Delhi , 1990
5. Instrumentation Devices and systems , Rangan, Sharma and Mani , Tata McGraw Hill Publishing Co , 1990

### Course Outcome:

After successful completion of the course, student will be able to:

1. Know type of measuring systems and their characteristics.
2. Know the I.S. code for engine testing
3. Study the mechanical and electromechanical measuring instruments.
4. Study the engine and vehicle experiment technique.

### List of Experiments:

1. Study of Static and Dynamic Measurement systems.
2. Study of sound and vibration instrumentation, measurement and analysis.
3. Study of FFT analyzer.
4. A brief report on I.S Code for Engine testing and a study on Instrumentation used for performance testing of engine.
5. Study of Warning and Alarm Instruments
6. Evaluation of Sound Power Level Measurement by Sound Pressure Level.
7. Evaluation of Sound Power using Sound Intensity Mapping.
8. Calibration and Phasing of Diesel Fuel Injection Pump on Fuel Pump test bench.
9. A Brief Report on Vehicle Experimental Techniques.
10. Visit of well equipped Automobile workshop

**Open Ended Problems:**

Various experimental techniques may be demonstrated to students, for example Demonstration of Car scanner etc.

**Review Presentation (RP):** 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. The same list will be uploaded on GTU website during the first two weeks of the start of the semester. Every student or a group of students shall critically study 2 papers, integrate the details and make presentation in the last two weeks of the semester. The GTU marks entry portal will allow entry of marks only after uploading of the best 3 presentations. A unique id number will be generated only after uploading the presentations. Thereafter the entry of marks will be allowed. The best 3 presentations of each college will be uploaded on GTU website.