

GUJARAT TECHNOLOGICAL UNIVERSITY

Semester: 4

Diploma in Power Electronics

Subject Name ELECTRONIC INSTRUMENTS AND MEASUREMENTS

Sr.No	Course content
1.	INTRODUCTION 1.1 Necessities of measurements 1.2 Definitions: accuracy, precision, resolution 1.3 Types of errors 1.4 Limiting of errors
2.	BRIDGES 2.1 Wheatstone bridge 2.2 Limitations of wheatstone bridge 2.3 Kelvin's double arm bridge 2.4 Unbalance conditions 2.5 Maxwell's bridge 2.6 Hay bridge 2.7 Schering bridge 2.8 Wien's bridge
3.	BASIC PARAMETER MEASUREMENTS 3.1 Moving coil and moving iron type 3.2 DC voltmeter 3.3 AC voltmeter using three terminal rectifier and half wave rectifier 3.4 Amplified DC meter 3.5 Electronic multimeter 3.6 Hot wire 3.7 Watt meter, Energy meter, clip-on meter (clamp-meter) 3.8 Digital Voltmeter: features, advantages, types- ramp type, integrating type and successive approximation type DVMs 3.9 Q-Meter: basic circuit, applications, series and parallel connection with equations
4.	OSCILLOSCOPE 4.1 C.R.O. Block Diagram 4.2 Cathode ray tube: construction, operation, screens, graticules 4.3 Vertical deflection system 4.4 Delay Line 4.5 Multiple trace CRO 4.6 Horizontal deflection system 4.7 Oscilloscope probe: structure of 1:1 and 10:1 probes 4.8 Measurement of frequency, time delay, phase angle and modulation index 4.9 Digital storage oscilloscope

5.	SIGNAL GENERATORS 5.1 Audio frequency signal generation 5.2 Sweep frequency generator 5.3 Pulse and square wave generator 5.4 Function generator
6.	FREQUENCY COUNTERS 6.1 Simple frequency counter 6.2 Display counter 6.3 Cascading counters 6.4 Multiplexing of display in frequency counter 6.5 Time base 6.6 Input signal processing 6.7 Period measurement 6.7.1 Period of pulse with non-zero rise and fall times 6.7.2 Period measurement for frequency evaluation 6.8 Measurement errors 6.8.1 Gating errors 6.8.2 Time base errors 6.8.3 Triggering level errors
7.	TRANSDUCERS 7.1 Classification of transducers 7.2 Unbonded strain gauge 7.3 Displacement transducers 7.4 Capacitive transducers 7.5 Inductive transducers 7.6 Linear Variable Differential Transformer (LVDT) 7.7 Piezo-electric transducer 7.8 Velocity transducer 7.9 Temperature measurements 7.10 Resistance thermometer 7.11 Thermocouples and thermistors
8.	COMPONENT TESTERS AND SIGNAL ANALYZERS 8.1 Transistor tester: conduction type, beta tester, curve tracer 8.2 Digital IC tester 8.3 Logic analyzer: Block diagram and operation 8.4 Spectrum analyzer: Block diagram and operation

LABORATORY EXPERIENCES:

The sample experiments to be performed include, but are not limited to the following.

1. To Measure unknown resistance using whetstone bridge.
2. To measure unknown inductance using Maxwell bridge.
3. To measure unknown inductance using hay bridge.
4. To convert milli Ammeter into Ohmmeter.
5. To convert milli Ammeter into Voltmeter.

6. To measure frequency & Phase using lissajous pattern on CRO.
7. To test transistors using transistor tester.
8. To obtain characteristics of LVDT.
9. To extend the range of milli Ammeter & Voltmeter.
10. To obtain strain gauge transducer characteristic.
11. To obtain millivolt V/S temperature characteristic of thermo couple.
12. To obtain resistance V/S temperature characteristic of RTD.
13. To study application of Q. meter.
14. To test hartley oscillator circuit.
15. To test colpitts oscillator circuit.
16. To measure characteristics of different filters using spectrum analyzer
17. To test various ICs using IC tester

Reference Books:

1. Electronic Instruments and Measurement Techniques - W.D. Cooper and A.B. Halfrick
2. Electrical Measurement A.K. Sahani
3. Elements of Electronic Instrumentation and Measurement – Joseph.J.Carr
4. Electronic Instrumentation and Measurements - David A bell
5. Electronic Measurements and Instrumentation – K. Lal Kishore