

3/4 B.Tech. SIXTH SEMESTER
ELECTIVE – I

EM6T4C

ELECTRONIC INSTRUMENTATION

Credits: 3

Lecture: 3 periods/week

Internal assessment : 30 Marks

Tutorial: 1 period /week

Semester end examination: 70 marks

Course objectives:

- To study basic concepts Related to Measurement and Instrumentation
- To Understand various signal generation sources in Measuring process Of current,voltage,frequency
- To understand the working principle of CRO
- To understand the working of various AC and DC Bridges used in Measurement of Resistance,Inductance,capacitance
- To understand principle implying various process variables

Learning Outcomes:

At the end of this course, the Student will be able to

- Understand the basic concepts in Instrumentation and measurements
- Analyse the various signal generation sources
- Understand the working of various Ac & DC Bridges
- Identify the sensors for measuring various process variables.

UNIT I

Introduction to Instrumentation, Performance characteristics of instruments, Static characteristics, accuracy, Resolution, Precision, Expected value, Error, Sensitivity. Errors in Measurement, Dynamic Characteristics-speed of response, Fidelity, Lag and Dynamic error .

UNIT II

Signal sources- fixed and variable, AF oscillators, Standard and AF sine and square wave signal generators, Function Generators, Square pulse, Random noise, sweep, Arbitrary waveform

UNIT III

Analyzers - Distortion, waveform, communication signal, Transmission, Logic and spectrum analyzers, Serial data compliance & Analysis, capacitance-voltage Analyzers.

UNIT IV

Oscilloscopes CRT features, vertical amplifiers, horizontal deflection system, sweep, trigger pulse, delay line, sync selector circuits, simple CRO, triggered sweep CRO, Dual beam CRO.

UNIT V

Dual trace oscilloscope, sampling oscilloscope, storage oscilloscope, digital readout oscilloscope, digital storage oscilloscope, Lissajous method of frequency measurement,

capacitance & Inductance measurement, standard specifications of CRO, probes for CRO- Active & Passive, attenuator type

UNIT VI

AC Bridges -Measurement of inductance- Maxwell's bridge, Anderson bridge. Measurement of capacitance-Schering Bridge. Measurement of impedance- Kelvin's bridge, Wheat stone bridge. Hay's bridge, Wien Bridge, LCR Bridge, Resonance Bridge. Errors and precautions in using bridges.

UNIT VII

DC Bridges -Wheatstone bridge and Kelvin bridge design, bridge sensitivity, errors in bridge circuits, null type and deflection type bridges, current sensitive and voltage sensitive bridges, applications of DC bridges

UNIT VIII

Measurement of physical parameters force, pressure, velocity, humidity, moisture, vacuum level, acceleration, speed, proximity and displacement. Data acquisition systems.

Learning resources

TEXTBOOKS:

1. Electronic instrumentation, second edition - H.S.Kalsi, Tata McGraw Hill, 2004.
2. Modern Electronic Instrumentation and Measurement Techniques – A.D. Helfrick and W.D. Cooper, PHI, 5th Edition, 2002.

REFERENCES:

- 1 Electronic Instrumentation & Measurements - David A. Bell, PHI, 2nd Edition, 2003.
2. Electronic Test Instruments, Analog and Digital Measurements - Robert A. Witte, Pearson Education, 2nd Ed., 2004.
3. Measuring systems, Applications and Design - E.O. Doebelin, McGraw Hill, 4th Ed., 1990.
4. Electronic Measurements - Oliver and Cage, ISE, McGrawHill, 1971.
5. Electronic Measurements & Instrumentation by K. Lal Kishore, Pearson Education - 2005.