

3/4 B.Tech. FIFTH SEMESTER FREE ELECTIVE

FE

INSTRUMENTATION

Credits: 4

Lecture: 4 periods/week

Internal assessment: 30 marks

Tutorial: 1 period /week

Semester end examination:70 marks

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**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, CRO and Oscilloscopes
- 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
- Analyze the various signal generation sources
- Understand the working of various Ac & DC Bridges
- Identify the sensors for measuring various process variable.

UNIT I

**INTRODUCTION:**

Static and Dynamic characteristics of instruments, dead zone, hysteresis, threshold, resolution, input & output impedance, loading effects, fundamentals of measurements, calibration of instruments, traceability, calibration report & certification.

UNIT II

**ANALOG INDICATING INSTRUMENTS:**

DC galvanometer, PMMC and Moving Iron instruments, voltmeters, ammeters, ohmmeters, wattmeters, energy meters, multimeters and extension of range of instruments. AC indicating instruments, DC Potentiometers, self-balancing potentiometers

UNIT III

**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 IV

**AC Bridges:**

Maxwell bridge, Hey bridge, Schering bridge, Wein bridge, storage and dissipation factor, applications of AC bridges

UNIT V

**DIGITAL INSTRUMENTS:**

Digital Multimeter, Kilo Watt Hour meter, Phase meter, Digital Tachometer, Ultrasonic Distance meter, Digital Thermometer

UNIT VI

**OSCILLOSCOPE:**

General purpose oscilloscope, construction, front panel controls, deflection sensitivity, dual trace CRO, measurement of electrical parameters like voltage, current, frequency, phase, Z-modulation, Digital Storage Oscilloscope.

UNIT VII

**RECORDING INSTRUMENTS :**

Principle and working of strip chart and X-Y recorders, multichannel recorders

UNIT VIII

**WAVEFORM GENERATION**

Waveform generation methods, Function generator, Virtual Instrumentation

**Learning resources**

**TEXT BOOKS:**

1. W. D. Cooper & A. D. Helfrick, 'Electronic Instrumentation And Measurement Techniques', PHI, 4<sup>th</sup> /d, 1987
2. David Bell, 'Electronic Instrumentation and Measurements', PHI, 2e/d.

**REFERENCE BOOKS:**

1. Anand M. M. S., 'Electronic Instruments and Instrumentation Technology', PHI, 2004
2. Kalsi H. S., 'Electronic Instrumentation', TMH, 2nd e/d, 2004
3. R. Subburaj, 'The foundation for ISO 9000 and TQM',
- 4.. Bouwens A. J., 'Digital Instrumentation'