

**DISCIPLINE SPECIFIC CORE COURSE– 6 (DSC-6): Electronic Instrumentation****Credit distribution, Eligibility and Pre-requisites of the Course**

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Electronic Instrumentation INDSC2C	4	3	0	1	Class XII pass with Science	Nil

**Learning Objectives**

The Learning Objectives of this course are as follows:

- To study different AC and DC measurement instruments used in laboratory like ohmmeter, voltmeter, ammeter and multimeter
- To learn about different measuring instruments—Universal counter, Cathode Ray Oscilloscope and Signal Generator
- To study about different spectrum analyzers and learn about basic concept of wave analyzers

**Learning outcomes**

The Learning Outcomes of this course are as follows:

Designing of different AC and DC bridges and their applications

Construction of different measuring devices-Ammeter, Voltmeter, Ohmmeter and Digital Frequency Meter

Develop an understanding of construction and working of different measuring instruments-Signal Generators and CRO for appropriate measurement

Understand the concepts of Spectrum Analyzer and Wave analyzers

**SYLLABUS OF DSC-6****Unit-1****(12 Hours)**

**DC and AC Bridges based measurements:** Wheatstone bridge, Kelvin bridge, General form of AC bridge balance, comparison bridges, Maxwell's bridge, Hay bridge, Schering bridge, Wien bridge, Wagner ground connection

**DC and AC indicating instruments:** DC voltmeter, ammeter, ohmmeters, multimeter,

AC voltmeter, Digital type voltmeters

#### **Unit-2**

**(12 Hours)**

**Digital frequency meter:** Elements of frequency meter, Universal counter and its different measurement modes, measurement errors and frequency range extension

**Signal Generators:** Types of generators and their operation: Audio oscillator, Function generators, Pulse generators, RF generators, Random noise generator, Sweep generator

#### **Unit-3**

**(12 Hours)**

**Electronic Displays:** Block diagram of a General-Purpose Cathode Ray Oscilloscope and its basic operation, electrostatic focusing and deflection, screens for CRT and graticules, CRT Connections

Types of CROs and measurement of frequency and phase: Dual trace oscilloscope, Digital storage oscilloscope (DSO), Sampling oscilloscope, Lissajous figures

#### **Unit-4**

**(09 Hours)**

**Spectrum and Wave Analyzers:** Spectrum analyzer, Harmonic distortion analyzer, Wave analyzer

**Q- Measurement:** Q-meter connections for low and high impedance measurements and errors

#### **Practical component (if any) - Electronic Instrumentation Lab – 30 Hours**

1. Study and operation of Multimeters (Analog and Digital), Function Generator, Regulated Power Supplies, CRO
2. Study the generation of Lissajous figures to find unknown frequency and phase shift
3. Measurements of Resistance Using Wheatstone/Kelvin Bridge
4. Measurements of Inductance Using Maxwell's Bridge/Inductance Comparison Bridge
5. Measurements of capacitance Using Capacitance Comparison Bridge/De Sauty's Bridge
6. Frequency measurement using Wein's Bridge
7. Study of R, L, C and Q meter
8. Study of Universal Counter
9. To study Loop tests for ground faults
10. To generate different signal waveforms

Note: Students shall sincerely work towards completing all the above listed practicals for this course. In any circumstance, the completed number of practicals shall not be less than seven.

#### **Essential/recommended readings**

1. H.S. Kalsi, Electronic Instrumentation and Measurements, Tata McGraw Hill (2019), 4th edition.

2. Joseph J Carr, Elements of electronic instrumentation and measurement, Pearson Education
3. (2005).
4. C.S. Rangan, G.R. Sarma and V.S. Mani, Instrumentation Devices and Systems, Tata McGraw Hill(1998).
5. H. Cooper, Modern electronic instrumentation and measurement techniques, Pearson Education (2015).
6. R.A. Witte, Electronic test instruments: Analog and digital measurements, Tata McGraw Hill (2004).
7. S. Wolf and R.F.M. Smith, Student Reference Manual for Electronic Instrumentation Laboratories, Pearson Education (2004).
8. David A. Bell, Electronic Instrumentation and Measurements, Prentice Hall of India, 2nd edition
9. U.A. Bakshi and A.V. Bakshi, Electronic Measurements and Instrumentation, Technical Publications

**Note: Examination scheme and mode shall be as prescribed by the Examination Branch, University of Delhi, from time to time.**