DISCIPLINE SPECIFIC CORE COURSE– 3 (DSC-3): Testing and Measurement (INDSC1C)

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		
Testing and Measurement (INDSC1C)	04	02	-	02	Course Admission Eligibility	Nil

Learning Objectives

The Learning Objectives of this course are as follows:

- To describe the units of measure and the various instruments used in various measurement parameters.
- To teach the various methods in power measurement.
- To make them understand about the error in measurement systems.
- To explain the various components of a testing and calibration system.

Learning outcomes

The Learning Outcomes of this course are as follows:

- Understand the basic concept of measurements and calibration
- Perform error measurement concepts correctly and present final values with the correct units/symbols
- Analyze various standardization techniques in Production Plants
- Familiarize with various testing and calibration procedures in measurement

SYLLABUS OF DSC-3

UNIT – I **(12 Hours)**

Introduction to Measurement System, Significance of Measurement, Methods of measurement, Elements of a generalized measurement system.

Performance characteristics of measurement system: Static Characteristics -Accuracy, Sensitivity, Linearity, Precision, Resolution, Threshold, Range, Hysteresis, Dead Band, Backlash, Drift, Impedance Matching and Loading.

Dynamic Characteristics- Types, Fidelity, Speed of Response, Dynamic Error.

UNIT – II **(12 Hours)**

Measuring Instruments: Introduction to Voltmeters, Ammeters, Ohmmeters, Digital Multimeters, Clamp Meter, Lux meter, Flux Meter, Tester, Function Generator, Bolometer, B-Dot and D-Dot Sensors.

Errors in measurement systems:

Definition of Errors: Systematic Errors, Instrumental Errors, Environmental Errors, Randoin Errors, Loading Errors, Limiting Errors. Source of Errors in Measuring Instruments.

UNIT – III **(9 Hours)**

Introduction to Testing, Fault, Types of Faults, Methods used for localizing faults, Methods used for ground and short circuit faults, Murray loop test, Varley loop test, location of open circuit faults in cable, types of Probes and Connectors.

UNIT – IV **(12 Hours)**

Standardization and Calibration Modelling: Standardization in Production Plants and manufacturing houses, Reliability studies and inspection, Product Standardization techniques, Calibration: Calibration of measuring instruments, Theory and Principles (absolute and secondary or comparison method), Setup, Modelling.

Various Testing and Calibration Systems: Sensor calibration and testing, Analytical methods in calibrating, Automated test and calibration systems.

Practical component - **(30 Hours)**

1. Testing of Active and Passive Components.
2. Testing of all basic components.
3. Calculation and verification of Resistance.
4. Calculation and verification of Voltage and Current.
5. Testing of Faulty equipment.
6. Fault diagnosis of Lab. Instruments.
7. Measurement of Temperature.
8. Measurement of Pressure.
9. Measurement of Power.
10. Measurement of Energy using Energy meter.
11. Study of Electrical and Mechanical parameters standards used in testing and calibration.
12. Calibration of Instruments.
13. Testing of Electrical Components.
14. Testing of Various Instruments.
15. Murray Loop test
16. Varley loop test
17. B-Dot sensor, D-Dot sensor
18. Study of Lux meter
19. Study of Flux meter
20. Study of Multimeter

Essential/recommended readings

1. Electrical measurement and measuring Instruments by Golding and Widdis.
2. Electrical and Electronic measurements and Instruments By A.K.Sawhney.

Suggestive readings

1. Electrical measurements and Measuring instruments By Rajendra Prasad.