COURSE CODE: **1151EE107**	COURSE TITLE: **MEASUREMENTS AND INSTRUMENTATION**	L	T	P	C
		2	**0**	**0**	**2**

COURSE CATEGORY:

Program Core

PREAMBLE :

To provide adequate knowledge in electrical instruments and measurements techniques

PREREQUISITE COURSES:

Basic Electrical Engineering

LINK TO OTHER SUBJECT:

Power Electronics

COURSE EDUCATIONAL OBJECTIVES :

To make the student have a clear knowledge of the basic laws governing the operation of the instruments, relevant circuits and their working

1. Introduction to general instrument system, error, calibration etc.

- Emphasis is laid on analog and digital techniques used to measure voltage, current, energy and power etc.
- To have an adequate knowledge of comparison methods of measurement.
- Elaborate discussion about storage & display devices.
- Exposure to various transducers and data acquisition system

COURSE OUTCOMES :

Upon the successful completion of the course, students will be able to:

CO Nos.	Course Outcomes	Knowledge Level (Based on revised Bloom's Taxonomy)
CO1	Explain about calibration, classify errors and standards	K2
CO2	Illustrate diagrammatically various types of instruments	K2
CO3	Explain various types of bridges required for measurements of required parameters	K2
CO4	Explain about types of display measurement devices	K2
CO5	Explain the types of transducers required for energy conversion	K2

CORRELATION OF COs AND POs

COs	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CO1	H				L						L	
CO2	L	H	L	H	H	H	H				L	
CO3	H		H	H	H		M				L	
CO4	H	H	M		H	H	L				L	
CO5	H		M		H	M	H				L	

COURSE CONTENT:

UNIT I	INTRODUCTION	6
Functional elements of an instrument – Static and dynamic characteristics – Errors in measurement – Statistical evaluation of measurement data – Standards and calibration		
UNIT II	**ELECTRICAL AND ELECTRONICS INSTRUMENTS**	**6**
Principle and types of analog and digital voltmeters, ammeters, multimeters – Single and three phase wattmeters and energy meters -Instrument transformers – Instruments for measurement of frequency and phase.		
UNIT III	**COMPARISON METHODS OF MEASUREMENT**	**6**
D.C & A.C potentiometers, D.C & A.C bridges, transformer ratio bridges, self-balancing bridges. Multiple earth and earth loops - Electrostatic and electromagnetic interference – Grounding techniques		
UNIT IV	**STORAGE AND DISPLAY DEVICES**	**6**
Magnetic disk and tape – Recorders, CRT display, digital CRO, LED, LCD & dot matrix display.		
UNIT V	**TRANSDUCERS AND DATA ACQUISITION SYSTEMS**	**6**
Classification of transducers – Selection of transducers – Resistive, capacitive & inductive transducers – Temperature transducers- Thermister, Thermocouple - LVDT, Pressure transducer– Strain gauges – Piezo electric– Elements of data acquisition system – A/D, D/A converters.		
		TOTAL: 30 PERIODS

TEXT BOOKS:

1. E.O. Doebelin, ‘Measurement Systems – Application and Design’, Tata McGraw Hill publishing company, 2003.
2. A.K. Sawhney, ‘A Course in Electrical & Electronic Measurements & Instrumentation’, Dhanpat Rai and Co, 2004

REFERENCE BOOKS:

1. D.V.S. Moorthy, ‘Transducers and Instrumentation’, Prentice Hall of India Pvt Ltd, 2003.
2. H.S. Kalsi, ‘Electronic Instrumentation’, Tata McGraw Hill, 1995.
3. Martin Reissland, ‘Electrical Measurements’, New Age International (P) Ltd., Delhi, 2001.
4. J. B. Gupta, ‘A Course in Electronic and Electrical Measurements’, S. K. Kataria & Sons, Delhi, 2003.
5. David A Bell, Electronic Instrumentation and Measurement, Third Edition, Oxford University Press, 2008.