ELECTRONIC MEASUREMENT AND INSTRUMENTATION

VI Semester: ECE

Course Code	Category	Hours / Week			Credits	Maximum Marks		
		L	T	P	C	CIA	SEE	Total
AEC014	Core	3	1	-	4	30	70	100
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil				Total Classes: 60		

OBJECTIVES:

The course should enable the students to:

I. Acquire a sound understanding theory and performance characteristics of instruments and errorsin measurement and apply to DC voltmeters, ammeters,ohmmeters.
II. Provide concepts and operation of different signal generators and wave formanalyzers.
III. Compare and contrast different types ofoscilloscopes.
IV. SelectdifferenttypesofD.CandA.Cbridgesfor measurement ofpassivecomponentsandphysical parameters.

COURSE OUTCOMES:

CO 1: Describe the types of voltmeters, ammeters, ohmmeters and Dynamic characteristics of measuring systems.
CO 2:Understand the different types of Oscilloscopes and their workingprinciples.
CO 3:Understand the Different types of signal generators and signal analyzers and their workingprinciples
CO 4:Explore the different types of A.C.and DC Bridges and theiroperations
CO 5:Demonstrate the different types of transducers and their principles and operations.

COURSE LEARNING OUTCOMES (CLOs):

1. AnalyzeBlockschematicsofmeasuringsystems,performancecharacteristicslikeaccuracy,precision, resolution and the types oferrors
2. Analyze Block schematics of measuring systems, performance characteristics like accuracy,precision, resolution and the types oferrors
3. Discuss various types measuring rangeMeters like DC and AC voltmetersammeters
4. Understand of basic building of Cathode ray oscilloscopes and cathode raytubes.
5. Illustrate the various types of special purpose oscilloscopes and discuss Lissajousfigures
6. Understand working principle of signal generators like AF and RF signalgenerators
7. Understand the function of various types of signal analyzers and discuss the type likeAF
8. Understand the various wave analyzers heterodyne waveanalyzers
9. Discuss various measurements using DCbridges for Wheat stone bridge, Kelvinbridge.
10. Discuss various measurements using AC bridges, Maxwell, Hay, Schering, Wien, Andersonbridges, wagner& groundconnection.
11. Understand transducers and its classifications and discuss strain gauges, force anddisplacement tranducers, resistance thermometers, hotwire anemometers, LVDT,thermocouples.
12. Discuss the types of transducers Piezoelectric transducers, variable capacitance transducers;Magneto strictivetransducers
13. Determine measurement of physical parameters Flow measurement, displacement meters, liquid level measurement, measurement of humidity andmoisture
14. Determine measurement of physical parameters Flow measurement, displacement meters, liquid level measurement
15. Illustrate the following: active and passiveelements
16. Illustrate the measurement of physical parameters of transducer like velocity, force, pressure, high pressure, vacuumlevel.
17. Illustrate the measurement of vacuum level,temperaturemeasurements

UNIT-I	INTRODUCTION TO MEASURING INSTRUMENTS	Classes: 08

Block schematics of measuring systems, performance characteristics, Static characteristics: Accuracy, resolution, precision, gauss error, types of errors, Dynamic characteristics : Repeatability, reproducibility, fidelity, lag; Analog measuring instruments: D' Arsonval movement, DC voltmeters and ammeter, AC voltmeters and current meters, ohmmeters, multimeters, meter protection, extension of range, digital voltmeters: Ramp type, staircase, dual slope integrating type, successive approximation type, specifications of instruments.

UNIT-II	OSCILLOSCOPE	Classes: 09

Oscilloscopes: CRT, block schematic of CRO, time base circuits, delay lines, high frequency CRO considerations, applications, specifications, special purpose oscilloscopes: Dual trace, dual beam CROs, sampling oscilloscopes, storage oscilloscopes, digital storage CROs, Lissajous figures, frequency measurement, phase measurement, CRO probes.

UNIT-III	SIGNAL GENERATOR AND SIGNAL ANALYZERS	Classes: 09

Signal Generators: AF and RF signal generators, sine and square wave generators, function generators: arbitrary waveform generator, sweep frequency generators, video signal generators, specifications.

Signal Analyzers: AF, HF wave analyzers, heterodyne wave analyzers, harmonic distortion, spectrum analyzers, power analyzers

UNIT-IV	AC AND DC BRIDGES	Classes: 10

Measurements using DC and AC bridges: Wheat stone bridge, Kelvin bridge, AC bridges, Maxwell, Hay, Schering, Wien, Anderson bridges, wagner& ground connection.

UNIT-V	TRANSDUCERS	Classes: 09

Transducers: Classification, strain gauges, force and displacement, tranducers, resistance thermometers, hotwire anemometers, LVDT, themocouples, synchros; Piezoelectric transducers, variable capacitance transducers; Magneto strictive transducers, measurement of physical parameters: Flow measurement, displacement meters, liquid level measurement, measurement of humidity and moisture, velocity,force, pressure, high pressure, vacuum level, temperaturemeasurements.

Text Books:

1. K.LalKishore,-ElectronicMeasurementsandInstrumentation‖,PearsonEducation,2nd Edition, 2010.
2. H.S.Kalsi,-ElectronicInstrumentation‖,TMH,2nd Edition,2004.
3. A.K.Sawhney,-Electricalandelectronicsmeasurementsandinstrumentation‖,19th Edition,2011.

Reference Books:

1. DavidA.Bell,-ElectronicInstrumentationandMeasurements‖,OxfordUniversityPress,1st Edition,2007.
2. A.D.Helbincs,W.D.Cooper,-ModernElectronicInstrumentationandMeasurementTechniques‖, PHI, 56th Edition,2003.
3. B.M.Oliver,J.M.Cage,-ElectronicMeasurementsandInstrumentation‖,TMH,Reprint,2009.
4. T.R.Padmanabham,-IndustrialInstrumentation‖,Springer,1st Edition,2009.

Web References:
1. https://www.scribd.com/ 2. https://www.worldcat.org/ 3. https://www.infibeam.com/ 4. https://www.abebooks.co.uk
E-Text Books:
1. https://www.vssut.ac.in/lecture_notes/lecture1423813026.pdf 2. fmcet.in/ECE/EC2351_uw.pdf 3. https://books.askvenkat.com/tag/measurement-and-instrumentation-lecture-notes-pdf 4. https://www.jntubook.com/electronics-measurements-instrumentation-textbook-free-d