

ELECTRONIC MEASUREMENT AND INSTRUMENTATION

VI Semester: ECE																				
Course Code	Category	Hours / Week			Credits	Maximum Marks														
AEC014	Core	L	T	P	C	CIA	SEE	Total												
		3	1	-	4	30	70	100												
Contact Classes: 45	Tutorial Classes: 15	Practical Classes: Nil			Total Classes: 60															
<p>I. COURSE OVERVIEW: The purpose of this course is to design, realization and use of Electronic Systems for the measurement of electrical and non-electrical quantities. It gives an emphasis on analog and digital instruments, oscilloscopes, signal generators, signal analyzers, AC / DC bridges and transducers. The knowledge of measurements and instrumentation is used to test and analyze the performance of measuring instruments in the field of science, engineering and technology.</p> <p>II. OBJECTIVES: The course should enable the students to:</p> <ul style="list-style-type: none"> I The performance characteristics and working principle of analog and digital instruments for measuring electrical quantities. II The analysis of various signals by using oscilloscopes and signal analyzers which have built in signal generators III The measurement of unknown resistive and reactive components by using various AC and DC bridge circuits. IV The construction and working of transducers for the conversion of physical quantities into electrical quantities <p>III. COURSE OUTCOMES: After successful completion of the course, students should be able to:</p> <ul style="list-style-type: none"> CO 1 Illustrate the fundamentals and working principle of analog and digital instruments for measuring of electrical parameters. Understand CO 2 Demonstrate the building blocks and functionality of oscilloscopes to display and measure the parameters of the signals. Understand CO 3 Utilize the signal generators to produce various signals for design and test the signal applications. Apply CO 4 Analyze the relative amplitude of the signal and its harmonic components in frequency domain by using Signal Analyzers Analyze CO 5 Identify appropriate bridge circuits for the measurement of unknown electrical parameters. Apply CO 6 Select the suitable transducers for measuring electrical and non-electrical parameters to resolve the real-world problem. Apply <p>IV. SYLLABUS:</p> <table border="1" style="width: 100%; border-collapse: collapse;"> <tr> <td style="width: 15%;">UNIT-I</td> <td style="width: 60%;">INTRODUCTION TO MEASURING INSTRUMENTS</td> <td style="width: 25%; text-align: right;">Classes: 08</td> </tr> <tr> <td colspan="3" style="padding: 5px;"> 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. </td> </tr> <tr> <td>UNIT-II</td> <td>OSCILLOSCOPE</td> <td style="text-align: right;">Classes: 09</td> </tr> <tr> <td colspan="3" style="padding: 5px;"> 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, </td> </tr> </table>									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,		
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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, and 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, transducers, resistance thermometers, hotwire anemometers, LVDT, thermocouples, synchros; Piezoelectric transducers, variable capacitance transducers; Magnetostrictive transducers, measurement of physical parameters: Flow measurement, displacement meters, liquid level measurement, measurement of humidity and moisture, velocity, force, pressure, high pressure, vacuum level, temperature measurements.		
Text Books:		
<ol style="list-style-type: none"> 1. K. Lal Kishore, "Electronic Measurements and Instrumentation", Pearson Education, 2nd Edition, 2010. 2. H.S.Kalsi, "Electronic Instrumentation", TMH, 2nd Edition, 2004. 3. A.K.Sawhney, "Electrical and electronics measurements and instrumentation", 19th Edition, 2011. 		
Reference Books:		
<ol style="list-style-type: none"> 1. David A. Bell, "Electronic Instrumentation and Measurements", Oxford University Press, 1st Edition, 2007. 2. A.D. Helbins, W.D. Cooper, "Modern Electronic Instrumentation and Measurement Techniques", PHI, 56th Edition, 2003. 3. B.M. Oliver, J.M. Cage, "Electronic Measurements and Instrumentation", TMH, Reprint, 2009. 4. T.R. Padmanabham, "Industrial Instrumentation", Springer, 1st Edition, 2009. 		
Web References:		
<ol style="list-style-type: none"> 1. https://www.scribd.com/ 2. https://www.worldcat.org/ 3. https://www.infibeam.com/ 4. https://www.abebbooks.co.uk 		
E-Text Books:		
<ol style="list-style-type: none"> 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 		