

| <b>ELECTRONIC INSTRUMENTATION</b>  |                                 |                   |           |
|--|---------------------------------|-------------------|-----------|
| <b>SEMESTER - III (EC/TC)</b>  |                                 |                   |           |
| <b>[As per Choice Based Credit System (CBCS) Scheme]</b>   |                                 |                   |           |
| <b>Course Code</b>   | <b>17EC32</b>                   | <b>CIE Marks</b>  | <b>40</b> |
| <b>Number of Lecture Hours/Week</b>  | <b>03</b>                       | <b>SEE Marks</b>  | <b>60</b> |
| <b>Total Number of Lecture Hours</b>   | <b>40 (08 Hours per Module)</b> | <b>Exam Hours</b> | <b>03</b> |
| <b>CREDITS - 03</b>  |                                 |                   |           |
| <b>Course objectives:</b> This course will enable students to: <ul style="list-style-type: none"> <li>• Define and describe accuracy and precision, types of errors.</li> <li>• Describe the operation of Ammeters, Voltmeters, Multimeters and develop circuits for multirange Ammeters and Voltmeters.</li> <li>• Describe functional concepts and operation of various Analog and Digital measuring instruments.</li> <li>• Describe basic concepts and operation of Digital Voltmeters.</li> <li>• Describe and discuss functioning and types of Oscilloscopes, Signal generators, AC and DC bridges.</li> <li>• Recognize and describe significance and working of different types of transducers.</li> </ul> |                                 |                   |           |
| <b>Module- 1</b>   |                                 |                   |           |
| <b>Measurement and Error:</b> Definitions, Accuracy, Precision, Resolution and Significant Figures, Types of Errors, Measurement error combinations. <b>(Text 2)</b>   |                                 |                   |           |
| <b>Ammeters:</b> DC Ammeter, Multirange Ammeter, The Ayrton Shunt or Universal Shunt, Requirements of Shunt, Extending of Ammeter Ranges, RF Ammeter (Thermocouple), Limitations of Thermocouple. <b>(Text 1)</b>  |                                 |                   |           |
| <b>Voltmeters and Multimeters:</b> Introduction, Basic Meter as a DC Voltmeter, DC Voltmeter, Multirange Voltmeter, Extending Voltmeter Ranges, Loading, AC Voltmeter using Rectifiers. True RMS Voltmeter, Multimeter. <b>(Text 1) L1, L2, L3</b>   |                                 |                   |           |
| <b>Module -2</b>   |                                 |                   |           |
| <b>Digital Voltmeters:</b> Introduction, RAMP technique, Dual Slope Integrating Type DVM, Integrating Type DVM, Most Commonly used principles of ADC, Successive Approximations, $3\frac{1}{2}$ -Digit, Resolution and Sensitivity of Digital Meters, General Specifications of DVM, <b>(Text 1)</b>   |                                 |                   |           |
| <b>Digital Instruments:</b> Introduction, Digital Multimeters, Digital Frequency Meter, Digital Measurement of Time, Universal Counter, Digital Tachometer, Digital pH Meter, Digital Phase Meter, Digital Capacitance Meter, <b>(Text 1) L1, L2,L3</b>  |                                 |                   |           |
| <b>Module -3</b>   |                                 |                   |           |

**Oscilloscopes:** Introduction, Basic principles, CRT features, Block diagram of Oscilloscope, Simple CRO, Vertical Amplifier, Horizontal Deflecting System, Sweep or Time Base Generator, Measurement of Frequency by Lissajous Method, Digital Storage Oscilloscope. **(Text 1)**

**Signal Generators:** Introduction, Fixed and Variable AF Oscillator, Standard Signal Generator, Laboratory Type Signal Generator, AF sine and Square Wave Generator, Function Generator, **(Text 1) L1, L2**

#### **Module -4**

**Measuring Instruments:** Field Strength Meter, Stroboscope, Phase Meter, Q Meter, Megger. **(Text 1)**

**Bridges:** Introduction, Wheatstone's bridge, Kelvin's Bridge; AC bridges, Capacitance Comparison Bridge, Inductance Comparison Bridge, Maxwell's bridge, Wien's bridge. **(Text 1) L1, L2, L3**

#### **Module -5**

**Transducers:** Introduction, Electrical transducers, Selecting a transducer, Resistive transducer, Resistive position transducer, Strain gauges, Resistance thermometer, Thermistor, Inductive transducer, - LVDT, Piezoelectric transducer, Photo cell, Photo voltaic cell, Semiconductor photo diode and transistor. **(Text 1) L1, L2, L3**

**Course Outcomes:** After studying this course, students will be able to:

- Describe instrument measurement errors and calculate them.
- Describe the operation of Ammeters, Voltmeters, Multimeters and develop circuits for multirange Ammeters and Voltmeters.
- Describe functional concepts and operation of Digital voltmeters and instruments to measure voltage, frequency, time period, phase difference of signals, rotation speed, capacitance and pH of solutions.
- Describe functional concepts and operation of various Analog measuring instruments to measure field Strength, impedance, stroboscopic speed, in/out of phase, Q of coils, insulation resistance.
- Describe and discuss functioning and types of Oscilloscopes, Signal generators and Transducers.
- Utilize AC and DC bridges for passive component and frequency measurements.

#### **Text Books:**

1. H. S. Kalsi, "Electronic Instrumentation", McGraw Hill, 3<sup>rd</sup> Edition, 2012, ISBN:9780070702066.
2. David A. Bell, "Electronic Instrumentation & Measurements", Oxford University Press PHI 2<sup>nd</sup> Edition, 2006, ISBN 81-203-2360-2.

#### **Reference Books:**

1. A. D. Helfrick and W.D. Cooper, "Modern Electronic Instrumentation and Measuring Techniques", Pearson, 1<sup>st</sup> Edition, 2015, ISBN:9789332556065.
2. A. K. Sawhney, "Electronics and Electrical Measurements", Dhanpat Rai & Sons. ISBN -81-7700-016-0



H. O. D.

Dept. Of Electronics & Communication  
Alva Institute of Engg. & Technology  
Mijar, MOODBIDRI - 574 225