Subject Code : RCCSIE7

ELECTRONIC INSTRUMENTATION AND MEMS

Unit I : Primary Sensing Elements and Transducers:

Transducers – Advantages of Electrical Transducers – Classifications of Transducers – Resistive Transducers – Potentiometers – Resistance type Strain Gauges – Temperature Sensors (Thermistor & RTD) – Inductive Transducers – LVDT – Eddy Current Sensors – Capacitive Transducers – Hall effect Transducers.

Unit II Electronic Instruments and Oscilloscopes:

Amplified DC meters – AC voltmeter using rectifiers – True RMS responding Voltmeter – Digital Voltmeter – Ramp type DVM – Successive Approximation conversion.
Oscilloscope types – Dual Trace CRO – Digital Storage Oscilloscopes – Sampling Oscilloscope, Instrumentation amplifier – Measurement using instrumentation amplifier – Measurement of small resistance change.

Unit III Counters and Timers:

Digital Counters and Timers – Different modes of operation – Frequency measurements – Frequency ratio measurements – Period measurements – Time interval and pulse width measurements – Inherent mode errors – Errors dependent on the functional mode – Automation in Voltmeters – Digital Multimeters – Accuracy in Digital Voltmeters.

Unit IV Data Acquisition Systems and Recorders:

Instrumentation Systems – Types of Instrumentation Systems – Components of Analog data acquisition system – Components of Digital data acquisition system – Uses of data acquisition systems.
Recorders – Recording requirements – Analog recorders – Graphic recorders (x-t), (x-y) – Oscillographic recorder (Ultra Violet type) – Magnetic tape recorders – Components of a Tape recorder – Digital Tape recorders – Recording techniques (Return to Zero Return to Zero)

Unit V Overview of MEMS and Microsystems:

MEMs and Microsystems – Typical MEMS and Micro system products – Evolution of Micro fabrication – Microsystems and Micro electronics – The Multidisciplinary nature of Microsystems and Miniaturization system modeling and properties of material : Introduction need for modeling (an example with micro systems) System types – basic modeling elements in mechanical system, electrical system, fluid system and thermal system.
Applications of Microsystems in the automotive Industry – Applications of Microsystems in telecommunications.

Text Books:

A Course in Electrical & Electronic Measurements & Instrumentation – A.K.Sawhey Dhanpat Rai & Co (P) Ltd., (Unit 1,2,5)
Modern Electronic Instrumentation & Measurement Techniques – Albert D.Helfrick, William D.Cooper – Prentice Hall of India (Unit 2)
Operational Amplifiers and Linear Integrated Circuits – Robert F.Coughlin, Fredrick F.Driscoll – Prentice Hall of India (Unit3)
Digital Instrumentation – A.J.Bouwens (Unit 4)
MEMS & Microsystems Design and Manufacture – Tai – Ran Hsu & MEMS – Nitaigour Premchand Mahalik – the Graw Hill Companies (Unit 5)