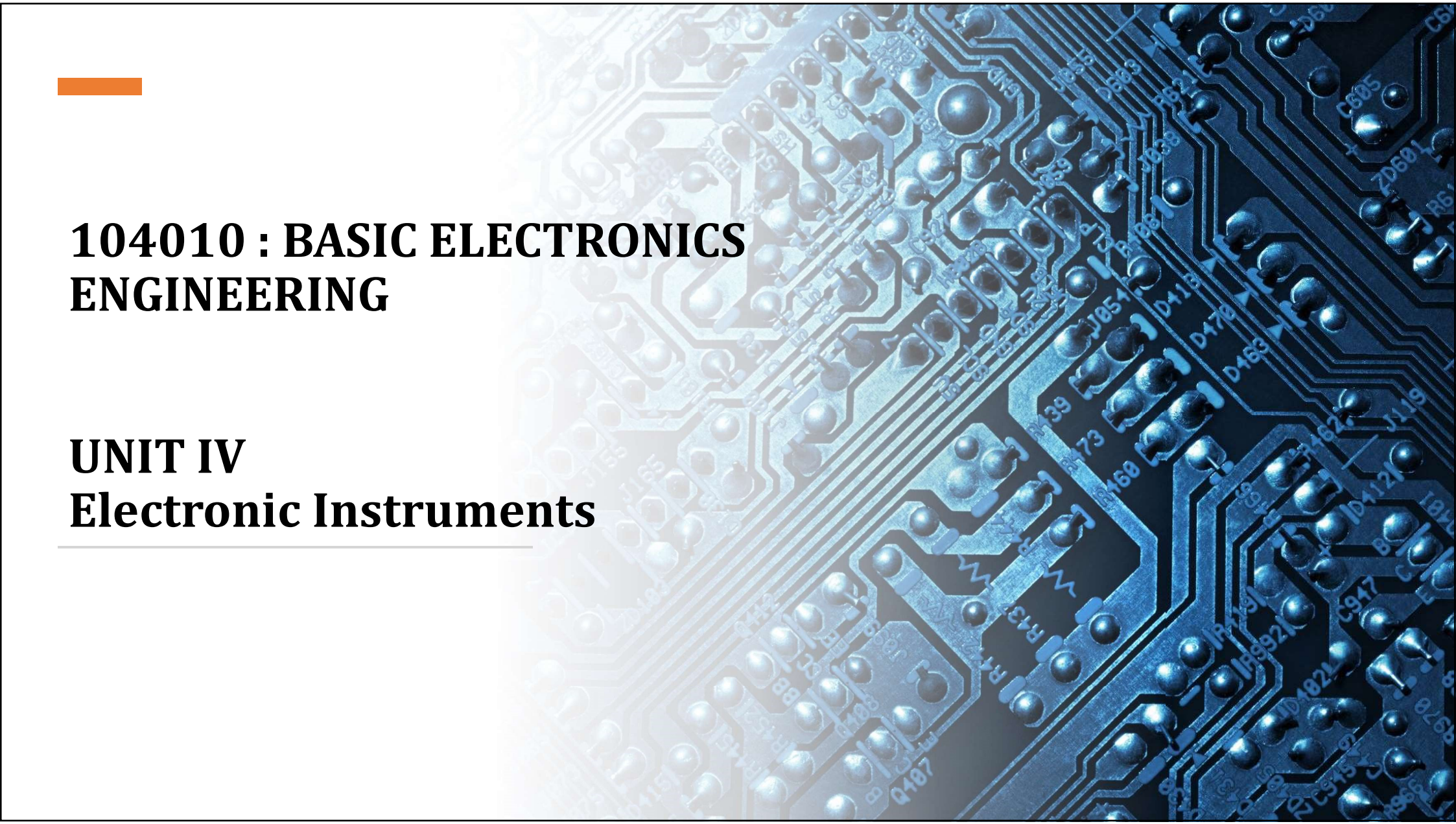

104010 : BASIC ELECTRONICS ENGINEERING

UNIT IV
Electronic Instruments

Measurement Error

A measurable quantity is a property of phenomena, bodies, or substances that can be defined qualitatively and expressed quantitatively. Measurable quantities are also called physical quantities

True value of a *measurand* is the value of the measured physical quantity, which, would ideally reflect, both qualitatively and quantitatively, the corresponding property of the object

Measurement Error is the deviation of the result of measurement from the true value of the measurable quantity, expressed in absolute or relative form

Error = Measured or Observed – True Value

Types of Static Error

Gross Error (Human error): Due to human mistakes in reading or in using instruments or in recording observations.

- Errors may also occur due to incorrect adjustment of an instrument & computational mistakes.
- These errors can not be treated mathematically.

Types of Static Error

Systematic Errors:

- Due to shortcomings of the instrument, defective or worn parts, or ageing or effects of the environment on the instrument.

Random Errors:

- Remain after gross & systematic errors are reduced.
- Accumulation of a large no. of small effects.
- Concerned in measurements of high degree of accuracy.
- Can be analysed statistically.

Sources of Errors

Other than Inability of An Instrument

- Insufficient knowledge of process parameters & design conditions.
- Poor design.
- Change in process parameters, irregularities, upsets.
- Poor maintenance.
- Errors caused by person operating the instrument.
- Certain design limitations.

Absolute Error and Relative Error

If A_m is Observed or measured value of a physical quantity with A_t is its true value, then

Error or Absolute Error $\Delta A = A_m - A_t$

Relative Errors are Error expressed as fraction of true value.

Relative Error = $\Delta A / A_t$

and can be expressed in % by multiplying with hundred.

References:

- “Electronic Instrumentation” by H.S. Kalsi, 3rd Edition, Tata McGraw Hill.
- “Electronic Instrumentation and Measurement” by William D. Cooper, Albert D. Helfrick , Prentice Hall PTR.
- Web Resources

Thank you!