SNS COLLEGE OF TECHNOLOGY

(An Autonomous Institution)

COIMBATORE-35

Accredited by NBA-AICTE and Accredited by NAAC – UGC with A++ Grade

Approved by AICTE, New Delhi & Affiliated to Anna University, Chennai

DEPARTMENT OF ELECTRICAL AND ELECTRONICS ENGINEERING

COURSE NAME: 23EET206/ Measurements and Instrumentation

II YEAR / IV SEMESTER

UNIT 1- FUNDAMENTALS OF MEASUREMENT

Topic 4 – Types and sources of Errors in measurements

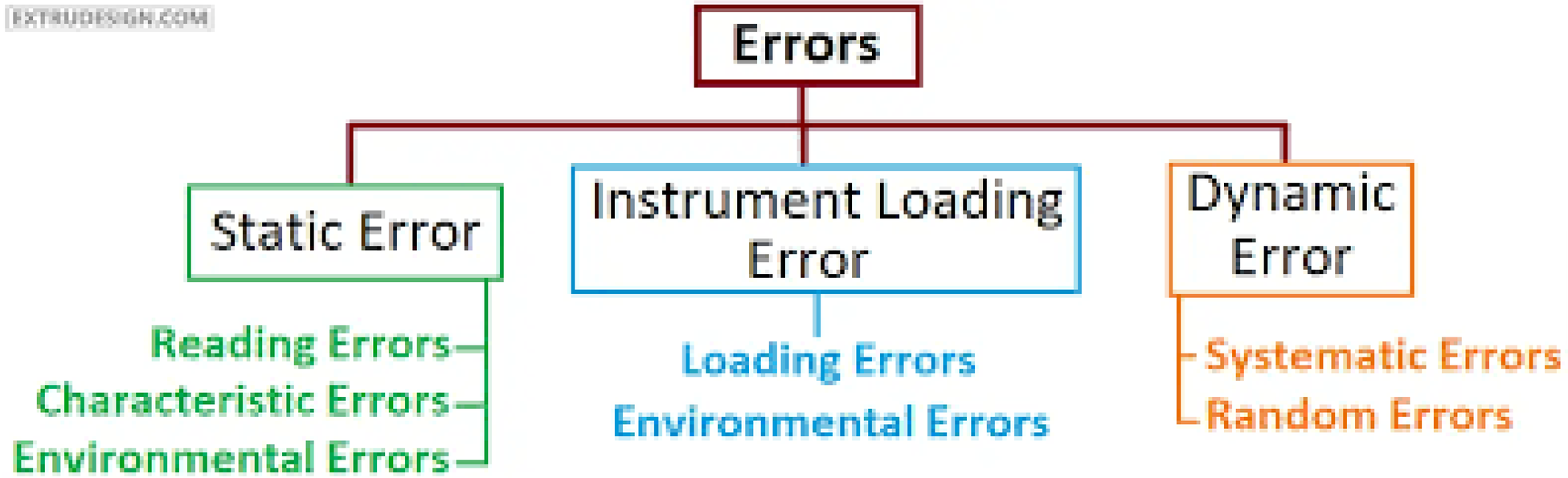
SUCCESSFUL STUDENT

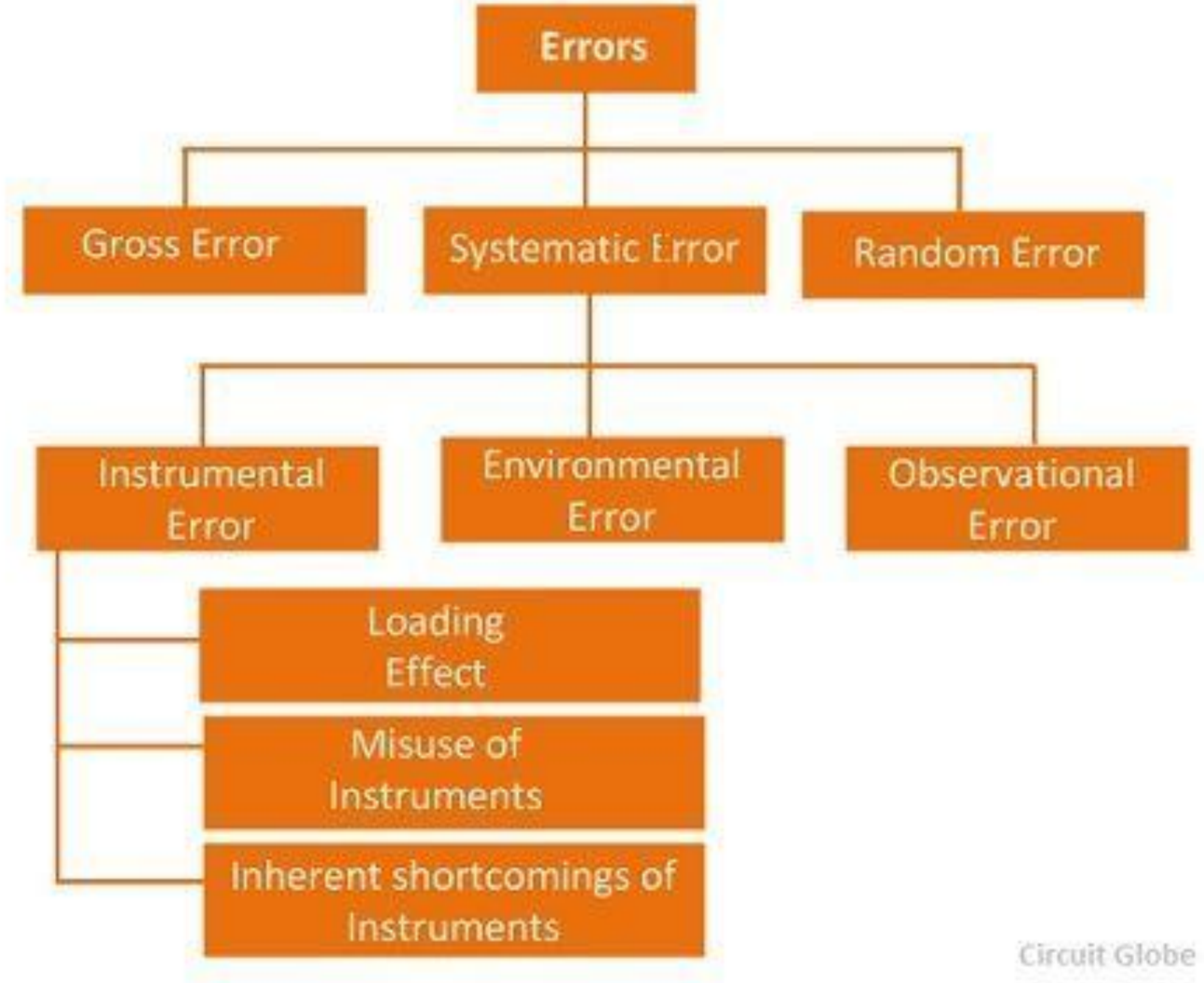
Positive Attitude

Professionally Groomed

Socially Interactive

Technically Skillful


EXTRUDESIGN.COM
Errors
Static Error
Instrument Loading Error
Dynamic Error
Reading Errors
Characteristic Errors
Environmental Errors
Loading Errors
Environmental Errors
Systematic Errors
Random Errors


Errors
Gross Error
Systematic Error
Random Error
Instrumental Error
Environmental Error
Observational Error
Loading Effect
Misuse of Instruments
Inherent shortcomings of Instruments
Circuit Globe

1. Gross Errors

The gross error occurs because of the human mistakes. For examples consider the person using the instruments takes the wrong reading, or they can record the incorrect data. Such type of error comes under the gross error. The gross error can only be avoided by taking the reading carefully.

For example – The experimenter reads the 31.5°C reading while the actual reading is 21.5C°. This happens because of the oversights. The experimenter takes the wrong reading and because of which the error occurs in the measurement.

Such type of error is very common in the measurement. The complete elimination of such type of error is not possible. Some of the gross error easily detected by the experimenter but some of them are difficult to find. Two methods can remove the gross error.

2. Systematic Errors

The systematic errors are mainly classified into three categories.

1. Instrumental Errors
2. Environmental Errors
3. Observational Errors

First order instrument

A large number of instruments are first order. This is of particular importance in control systems where it is necessary to take account of the time lag that occurs between a measured quantity changing in value and the measuring instrument indicating the change. Fortunately, the time constant of many first order instruments is small relative to the dynamics of the process being measured, and so no serious problems are created.

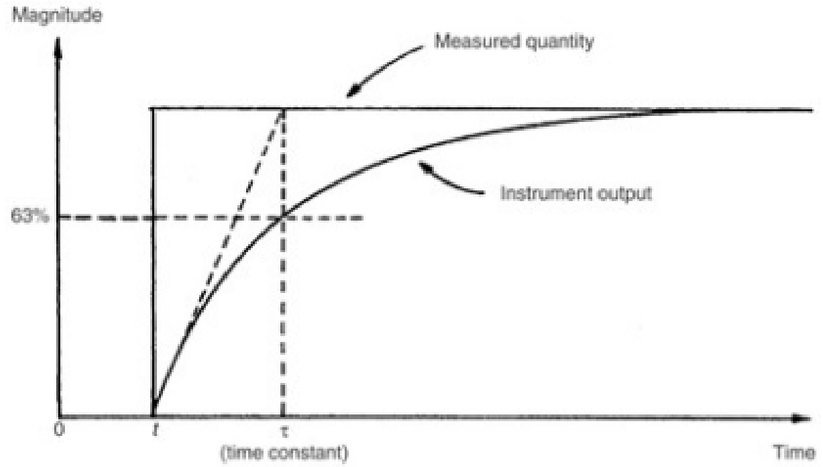


Fig. 2.11 First order instrument characteristic.

Second order instruments

The standard equation for a second order system or instrument is given by

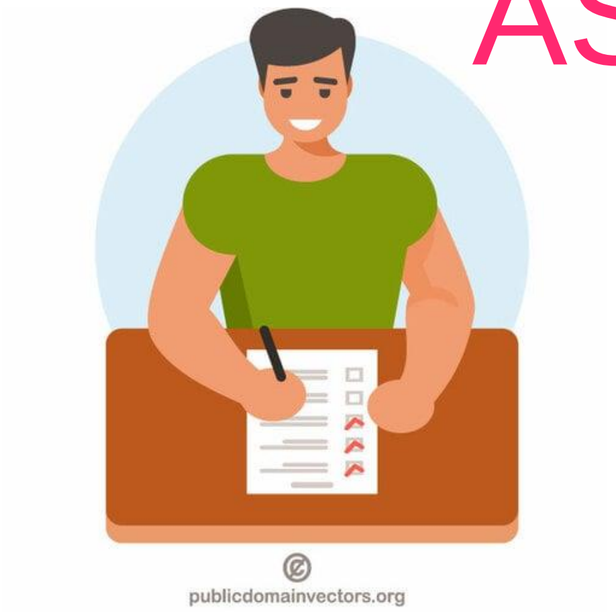
$$a_2 \frac{d^2y}{dt^2} + a_1 \frac{dy}{dt} + a_0 y = b_0 u$$

Which is usually written as

$$\frac{d^2y}{dt^2} + 2\eta\omega_n \frac{dy}{dt} + \omega_n^2 y = K\omega_n^2 u$$

Where ω_n is the undamped natural frequency and η is the damping ratio and K is the gain.

ASSESSMENT



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T1 **A. K. Sawhney, “A Course in Electrical & Electronic Measurements & Instrumentation”, Dhanpat Rai & CO., New Delhi, 2022.**

T2 **S. Gupta and J. John , "Virtual Instrumentation using Lab VIEW", Tata McGraw-Hill Publishing Company Limited, New Delhi, 2010.**

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R2 **Bouwens A J, “Digital Instrumentation”, Tata Mc Graw Hill, New Delhi2016**

R3 **Martin U. Reissland, “Electrical Measurement – Fundamental Concepts and Applications”, New Age International (P) Ltd., 2015**

R4 **J. B. Gupta, “A Course in Electronic and Electrical Measurements and Instrumentation”, S. K. Kataria & Sons, Delhi, 2013**

R5 **M. S. Anand, “Electronics Instruments and Instrumentation Technology”, Prentice Hall India, NewDelhi, 2012.**

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W3 **https://hombredelamancha.com/products/ebook-electrical-and-electronic-measurements-and-instrumentation?srsltid=AfmBOorTb5k9Ga1rsImj69-l3SximYYra7U8VhGcqYahqsfk9BR9rC7k**

THANK YOU!!