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 5 – Accuracy, Precision, Resolution, Sensitivity
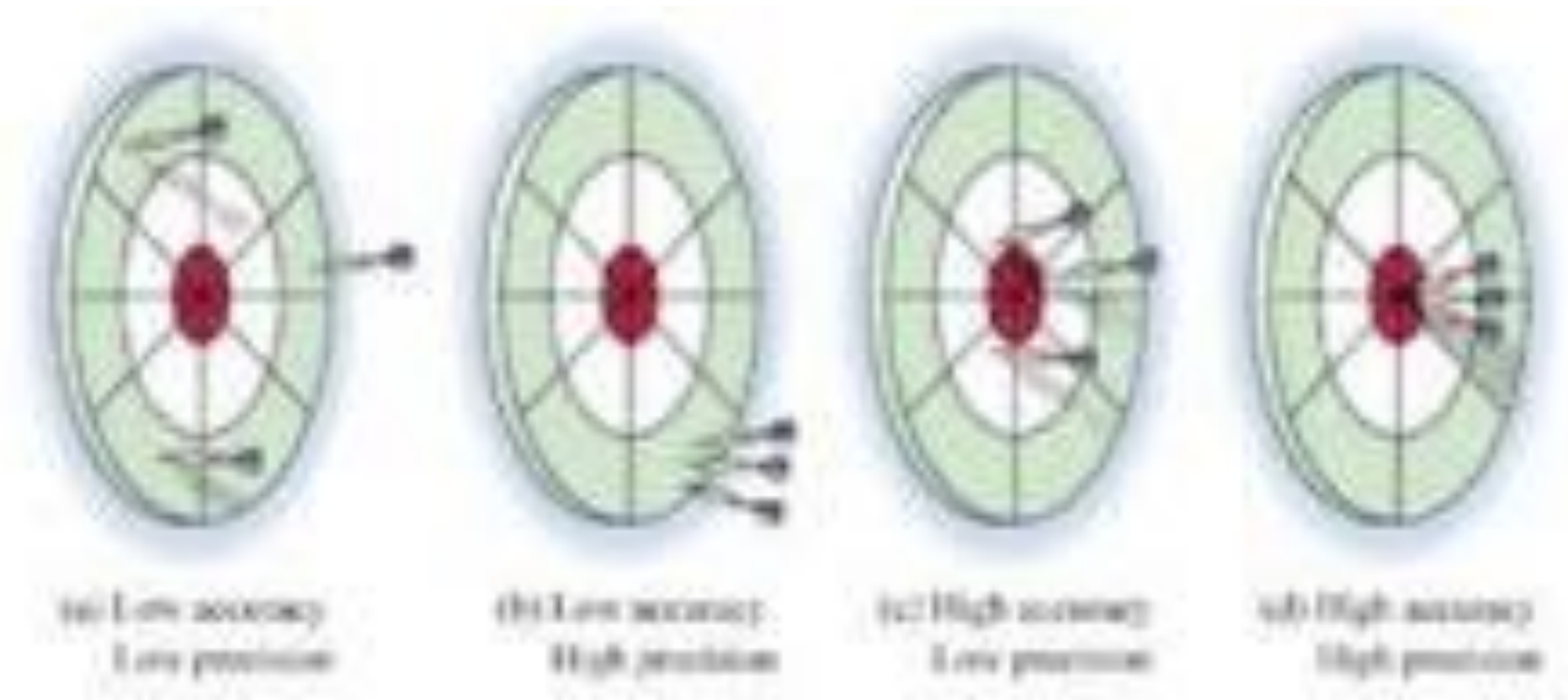
SUCCESSFUL STUDENT

Positive Attitude

Professionally Groomed

Socially Interactive

Technically Skillful

Whereas accuracy refers to how closely a measured value is to the actual value, precision refers to how closely individual, repeated measurements agree with each other. Precision is most affected by noise and short-term drift on the instrument

(a) Low accuracy Low precision   (b) Low accuracy High precision   (c) High accuracy Low precision   (d) High accuracy High precision

1. Accuracy

- For example, if a pressure gauge of range 0–10 bar has a quoted inaccuracy of $\pm 1.0\%$ f.s. ($\pm 1\%$ of full-scale reading), then the maximum error to be expected in any reading is 0.1 bar. This means that when the instrument is reading 1.0 bar, the possible error is 10% of this value.

- For this reason, an important rule is to choose the instrument which has measurement range appropriate to the spread of values being measured in order to achieve the best possible accuracy in the readings.

- Thus, if we were measuring pressures with expected values between 0 and 1 bar, we would not use an instrument with a range of 0–10 bar.

2. Precision (repeatability)

- **Precision** is a term that describes how close are repeated measurements of the same value of a measured variable.

- Repeated measurements of the same value can vary due to random errors. Thus, precision describes the instrument's degree of freedom from random errors.

- If a large number of readings are taken of the same quantity by a high precision instrument, then the spread of readings will be very small.

2. Precision (repeatability)

- Precision is often, though incorrectly, confused with accuracy. *High precision does not imply anything about measurement accuracy.*

- A high precision instrument may have a low accuracy.

- Low accuracy measurements from a high precision instrument are normally caused by a bias in the measurements, which is removable by recalibration.
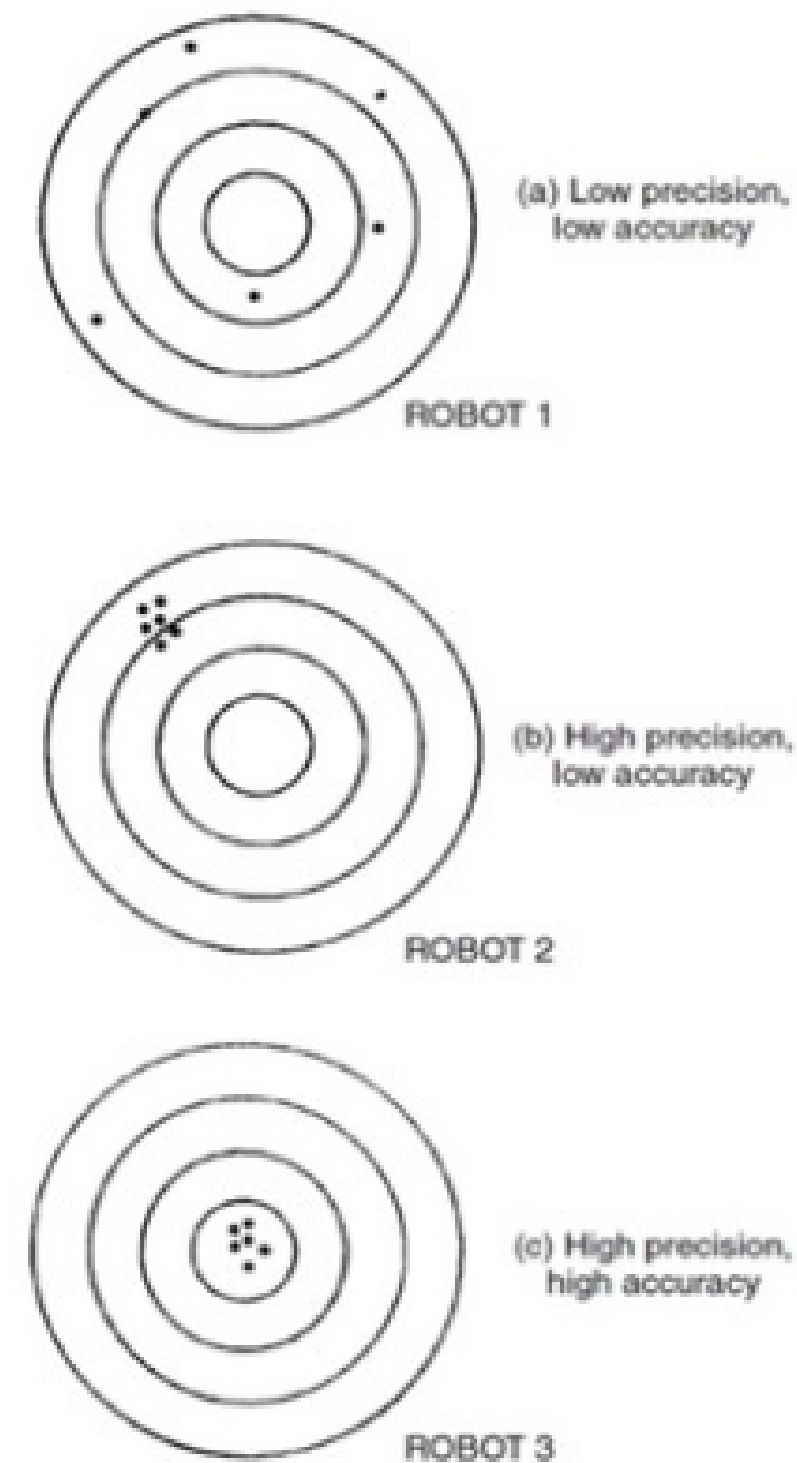

(a) Low precision, low accuracy
ROBOT 1

(b) High precision, low accuracy
ROBOT 2

(c) High precision, high accuracy
ROBOT 3

Fig. 2.5 Comparison of accuracy and precision.

3. Tolerance

- Tolerance is a term that is closely related to accuracy and defines the maximum error that is to be expected in some value.

- The accuracy of some instruments is sometimes quoted as a tolerance figure.

- For instance, crankshafts are machined with a diameter tolerance quoted as so many microns, and electric circuit components such as resistors have tolerances of perhaps 5%. One resistor chosen at random from a batch having a nominal value 1000Ω and tolerance 5% might have an actual value anywhere between 950Ω and 1050Ω.

ASSESSMENT

23EET206 /Measurements and Instrumentation/Mr.R.Vijayakumar/AP/EEE

REFERENCE

TEXT BOOKS

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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R1   David A.Bell, "Electronic Instrumentation and Measurements", Oxford Higher Education, 2013

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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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W2   https://www.vssut.ac.in/lecture_notes/lecture1423813026.pdf

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

THANK YOU!!