

All forks in 225(braches)

My way of memorizing

1- why we need to measure things?

- I chose the easiest four to memorize

We call them the Cite

1- customer satisfaction

2- interchangeability

3-true dimensions

4- establish standards

Methods of measurements

- This one is easy you can memorize all six of them
 - Lets put them as letters again
 - 3 D's
 - Direct ,inDirect, and Deflection
 - And the 3 C's
 - Comparison , Complementary , Contact

Measurement applications

- CEM
 - Control of (process and operations)
 - Experimental engineering analysis
- Monitoring of (process and operations)

Choosing appropriate measuring instruments

- We call this one (nice CARS)
 - Cost-effectiveness
 - Accuracy
 - Resolution
 - Sensitivity

And we finished the first lecture , easy right?

Lecture 2

Its mostly definitions so its easy to understand

Last slide there is (necessity of calibration)

FDDM , is the easiest thing I found to memorize it

- Fumes or smoke
 - Dust
 - Dirt
- Mechanical wear

Lecture 3

- Sources of systematic errors

I think you know it by now, its gonna be new letters so better start to write them and organize them nicely

SWEC

1- Systematic errors due to measurement

2- Wear of instruments

3-Error due to environmental input

Connecting leads

How to reduce them ?

- By using the 4 C's
 - Careful designe
 - Careful analysis of test conditions
- Comparing your results with other obtained independently
 - Calibration

The principles of calibrations should be understood imo not memorized

Causes of induced noise

- PPP and internal

1-proximity to mains-powered equipment

2-proximity to fluorescent lighting circuit

3- proximity to radio and audio frequencies

And

Internal noise include shot noise and thermoelectric potentials

Types of biomedical sensors

- PEC

1- physical sensors

2-Electrical sensors

3-Chemical sensors

Three types of devices

- (Displacement) And (Elastic resistive) transducers
 - $L = n^2 * G * M$ $R = \rho * (l/A)$
 - Potentiometers
- Linear proportion between V and Displacement

Biomedical measurement

- ECG (heart) most common is “floating”
- EMG (muscles) *non-invasive* *circular disc most common*
- EEG (brain) *Cup and subdermal electrodes*

Non-invasive measurements for O₂ and CO₂ are based on two discoveries

- O₂ and CO₂ diffuse through skin
- Blood changes color depending on the amount of oxygen bonded to hemoglobin

Oxygen transportation

- 2% carried dissolved in plasma
- 98% is inside the erythrocytes

Pulse oximetry

- 1- red wavelength
- 2- the near infrared region of the spectrum

beer-lamberts law :

$$P_t = P_o * 10^{-abc}$$

a:wavelength

b:is the light path length

c:is the concentration of the sample

Ph electrodes

- Reference and Active electrodes

Intrinsic changes:

ASFR (اصفر)

- Absorbance
 - Scattering
- Fluorescence
- Reflectance

Light sources and detectors

Sources are LLL

- tungsten-filament LAMPS
 - Laser diodes
- Light-emitting diodes

Detectors are Ph

- Photo(cells)
- Photo(transistors)
- Photo(diodes)

Advantages of optical sensors

- Small and flexible
- Free from electrical interference
- Instantaneous response to microenvironment

Presenting digital data

LCD can stand for all three of them

- L for LCD
- C for computer monitor
- D for segment Display

Improving reliability

CCPR

- Choice of instrument
 - Calibration
 - Protection
 - Redundancy