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|  | *Essential vocabulary & concepts* | T-316-LABB Fall 2023 |

Welcome to T-316-LABB Measurement Systems!

T-316-LABB Measurement Systems is about:

* learning to confidently encounter a sensor or experimental system for the first time
* learning to plan & execute an experiment, reduce the data, and report the results & uncertainties
* learning to use uncertainty analysis as a tool to design experiments
* learning the principles of operation of commonly-encountered transducers
* learning to manage the ambiguity of engineering experimentation

# Terms and definitions to learn.

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| Definition | Term | Example |
| The physical quantity we want to measure. |  | temperature |
| A device that accepts a measurand as an input and produces a signal as an output. |  | [https://encrypted-tbn1.google.com/images?q=tbn:ANd9GcTr5QRJzFc6VLapFH5H-RrukgAms__QzFxsnPAwSVLsEna0WTMp](http://www.google.com/imgres?hl=en&rls=com.microsoft:en-us:IE-Address&rlz=1I7GGIE_en&biw=1141&bih=798&tbm=isch&tbnid=pRl1CQ5lCbvWzM:&imgrefurl=http://www.alibaba.com/product-free/106139814/Thermocouple_Thermocouple_RTD_sensors_RTD_sensors.html&docid=F4-nuOAJ5WS0WM&imgurl=http://i00.i.aliimg.com/photo/v0/106139814/Thermocouple_Thermocouple_RTD_sensors_RTD_sensors_in.jpg&w=579&h=432&ei=HhbhTteYFsy_2QWi2N3lBA&zoom=1) |
| A device that converts the sensor output signal into readable form. |  |  |
| An equation relating sensor input to output (or readout). Often linear. |  | *y* = 0.95 *x* + 0.02  where  input *x* is in ⁰C  output *y* is in Volts |
| The quantity an experiment is designed to produce as an outcome. Can be a function of several measurands. |  | density, |
| The resultant expressed as a function of the measurands. |  |  |

# Sensors you encounter in this course.

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| load cells,  strain-gage type | linear displacement potentiometer |  |  |
|  | [https://encrypted-tbn2.google.com/images?q=tbn:ANd9GcQ0zWxQkNKu0kiCgdmjRtxzxHPkIgFxy00dFhBvgA2GlTzaLviHeJU37JeWwA](http://www.google.com/imgres?hl=en&sa=X&rls=com.microsoft:en-us:IE-Address&rlz=1I7GGIE_en&biw=1141&bih=798&tbm=isch&prmd=imvns&tbnid=dUGukV6bZR3hVM:&imgrefurl=http://parts.digikey.com/1/parts-manfs/measurement-specialties-inc&docid=5hgrgCH07sEDrM&imgurl=http://media.digikey.com/Photos/Measurement%20Specialties%20Photos/MFG_3801A-0200.jpg&w=640&h=640&ei=gw3hTsqVCufU2AXgs7SgCA&zoom=1&iact=rc&dur=89&sig=112173702660406395142&page=5&tbnh=128&tbnw=129&start=97&ndsp=24&ved=1t:429,r:3,s:97&tx=82&ty=57)  accelerometer | Digital microscope |  |
|  |  |  |  |

# Principles of operation (“PO”) questions.

You should be able to answer the following questions for every sensor you encounter in the course (guaranteed to be an exam question):

1. What physical quantity is the measurand and how is it input to the sensor?
2. What happens inside the sensor to transform sensor input to sensor output?
3. What physical quantity is the output and how is it read?

# Sensor/readout system characteristics to learn.

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# Terms and definitions to learn.

excitation

input range (related: rated capacity)

output range (related: rated output, full-scale output, span)

calibration curve and calibration equation

sensitivity

resolution

accuracy