

# EG207 F20 Lab 1: Temperature and Humidity with the DHT11

## EG207 FA21 Laboratory 1 – DHT11 Temperature/Humidity Sensor

### OBJECTIVES

1. Establish a measurement system using a sensor, an Arduino board, and LabVIEW user interface.
2. Obtain time series data sets for statistical analysis to determine sensor accuracy and precision.
3. Gain an understanding of temperature and humidity measurement principles, and evaluate the DHT11.

### ARDUINO ACTIVITY REQUIREMENTS (3 points)

1. Configure and wire your DHT11 to the Arduino and test that it is working. Take a photo of your setup.
2. Using MS-Excel Data Streamer (or comparable utility) with the DHT11 in a stable environment, record a number of temperature and humidity time-stamped measurements into an MS-Excel file at a readout rate of 2 seconds.
3. Using the MS-Excel mean and standard deviation functions, determine the means and standard deviations of each (temperature and humidity) dataset.
4. Using a hair dryer or heat gun, expose the DHT11 sensor to a significant change in environment and record the DHT11 temperature at a very high rate in Arduino to a point where the temperature stabilizes. Create a chart showing the temperature transition. Determine the sensor temperature  $\tau$  value and response time. How does it compare to the published response performance? Note: The instructor is willing to provide this delta environment in class.

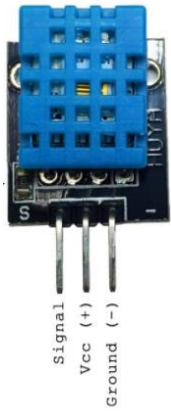
### LABVIEW/ARDUINO ACTIVITY REQUIREMENTS (4 points)

5. Construct a VI which collects the temperature and humidity data from the DHT11 and displays it on waveform charts on the VI front panel. Adjust the VI and Arduino timing to avoid “dropout” of data.
6. Configure the VI to also display the temperature and humidity readings as integer values and display them on the VI front panel.
7. Configure the VI to write time-stamped temperature and humidity data to an external file using the appropriate VI functions.

### LAB REPORT (3 points)

Write and submit a lab report with;

- Abstract: 3-6 sentence summary of the report
- Introduction: how does this type of sensor work? **Citations required in this section**, and figures helpful. What is the goal of this lab? What specific sensor are you testing?
- Methods: how did you complete the objectives of the lab? Explain the VI, hardware setup, and testing procedure. Pictures are often helpful here.
- Results: Data, reduced and displayed in a meaningful way. No conclusions or discussion in this section, though you should explain what data is being presented.
- Discussion: what answers do you infer from the data? What problems did you encounter, and what would you repeat, what would you change if you were to do this again?
- Conclusion: quick summary of objective and findings. Also, “lessons learned”, or how might you improve this lab exercise?



## RESOURCES

John G. Webster, & Halit Eren. (2014). Measurement, Instrumentation, and Sensors Handbook : Two-Volume Set. CRC Press.

[Ch 69 Thermistor thermometers](#)

Section 69.1 and 69.4

[Ch 25 Capacitive Sensors: Displacement, Humidity, Force](#)

Section 25.10

[DHT11 tutorial online](#)

DHT11 Technical Data Sheet (PDF) up in Team Project folder on BrightSpace

## **DELIVERABLES**

One zip file containing:

- MS-Excel or comparable file with Arduino Activity data and computations
- LabVIEW VI and Arduino sketch for LabVIEW Activity including External Data File
- Lab Report (MS-Word doc)