



COLLEGE OF ENGINEERING AND MINES
DEPARTMENT OF ELECTRICAL AND COMPUTER ENGINEERING

COURSE CODE	EE F102 F01 (CRN: 32862)
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COURSE NAME	INTRODUCTION TO ELECTRICAL AND COMPUTER ENGINEERING
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SEMESTER	SPRING	YEAR	2023
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LABORATORY LOCATION	JUB 331 (ELECTRONICS LAB)
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LAB SESSION DATE AND TIME	MONDAY 23 JAN 2023
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TYPE OF SUBMISSION	LABORATORY REPORT	NUMBER	1
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TITLE OF SUBMISSION	RESISTANCE MEASUREMENTS
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METHOD OF SUBMISSION	ONLINE VIA CANVAS
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DUE DATE OF SUBMISSION	MONDAY 30 JAN 2023	DUE TIME OF SUBMISSION	23:59
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STUDENT NAME	
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MAKE THIS FORM A "COVER PAGE" FOR YOUR REPORT SUBMISSION.	
FOR THE TA USE ONLY	
REMARKS:	

Objective:

To gain experience using digital equipment like the multimeter and the infrared thermometer. Learn how to measure resistance, characterize the operation of a thermistor over temperature (and view the linear relationship with temperature), and the possible variations for the resistors around their nominal values.

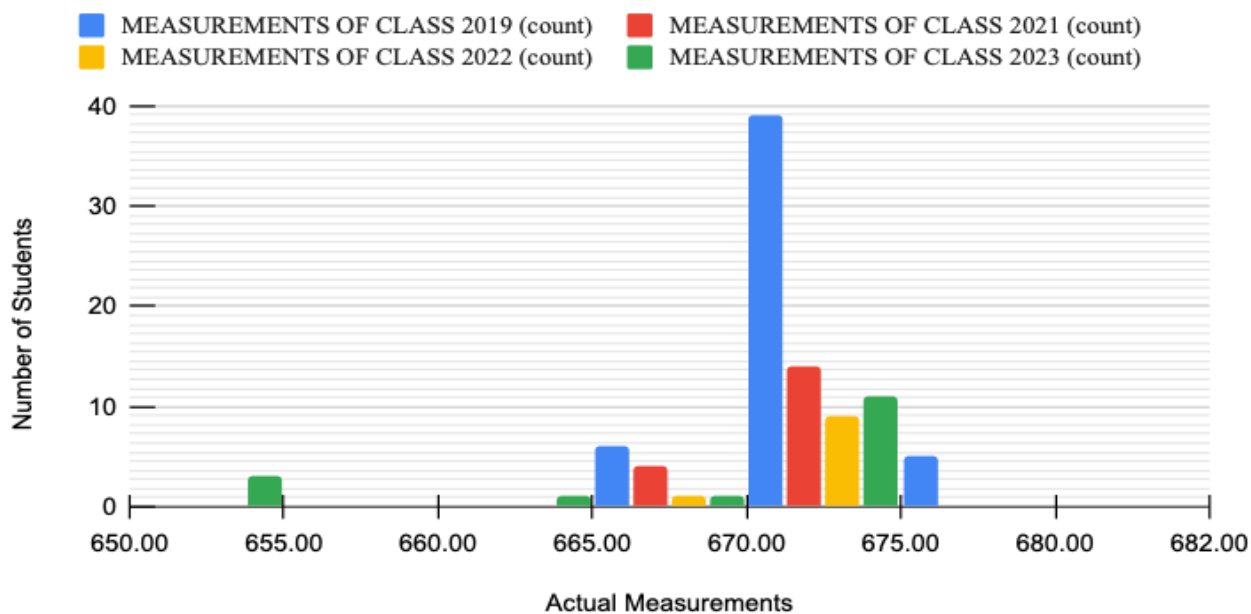
Resistor Measurements and Values				
Component	Component Marking	Decoded Value	Measured Resistance	% Difference
680 Ω	blue, violet, brown, gold	670 Ω	652.4 Ω	2.63%
680 Ω	blue, violet, brown, gold	670 Ω	653.38 Ω	2.48%
680 Ω	blue, violet, brown, gold	670 Ω	651.09 Ω	2.82%
680 Ω	blue, violet, brown, gold	670 Ω	652.2 Ω	2.66%
1 k Ω	brown, black, red, gold	1 k Ω	.971 k Ω	1.3%
47 k Ω	yellow, blue, orange, gold	46 k Ω	47.8 k Ω	-3.91%

(Table 1 Above)

Thermistor Resistance Measurements at Different Temperatures				
Measurement	Temperature	Measured Resistance	Expected Resistance (Using Eq 3)	% Difference
Room Temperature	75.8 $^{\circ}\text{F}$	9.730 k Ω / 97300 Ω	9.696 k Ω / 9696.37 Ω	.35 %
Cold	73.6 $^{\circ}\text{F}$	12.3 k Ω / 12300 Ω	9.161 k Ω / 9160.57 Ω	29.2 %
Hot	77.2 $^{\circ}\text{F}$	10.20 k Ω / 10200 Ω	10.051 k Ω / 10051.35 Ω	1.47 %

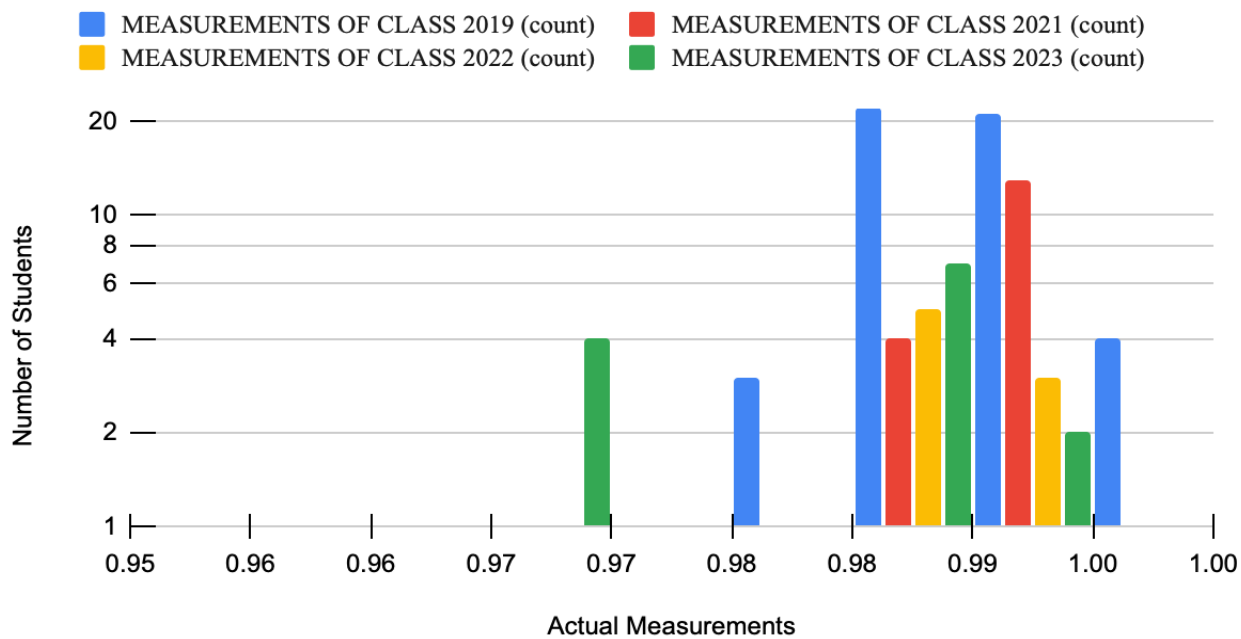
(Table 2 Above)

Measurements of 680(Ω) Resistor



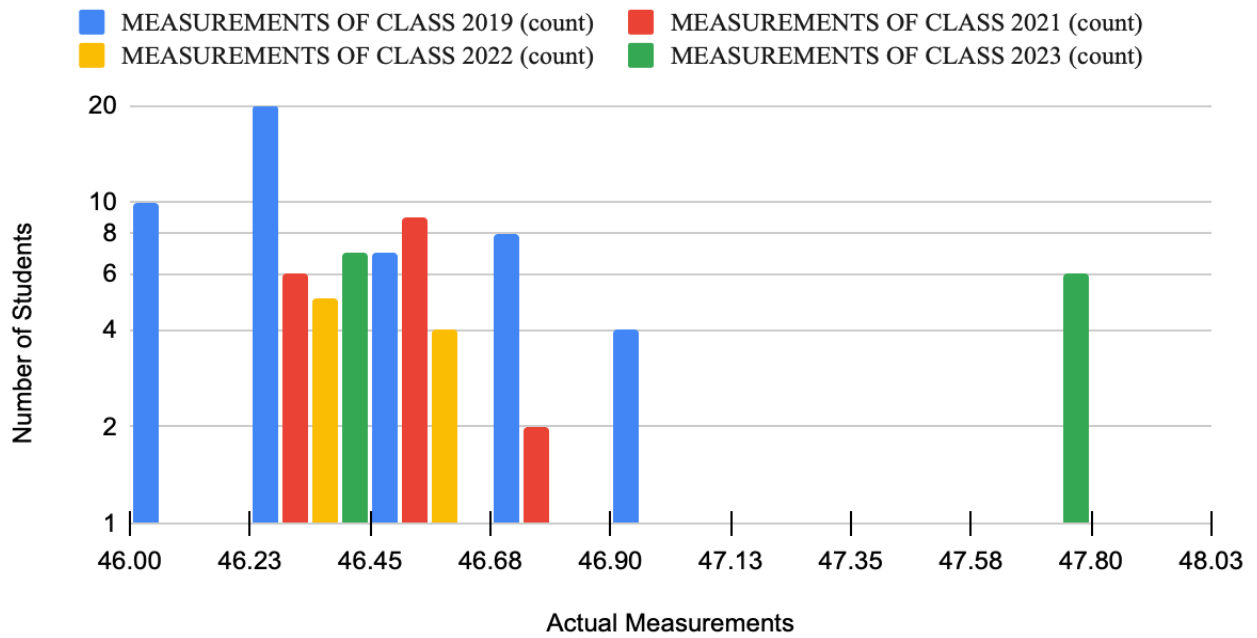
(1)

Measurements of 1.0(k Ω) Resistor



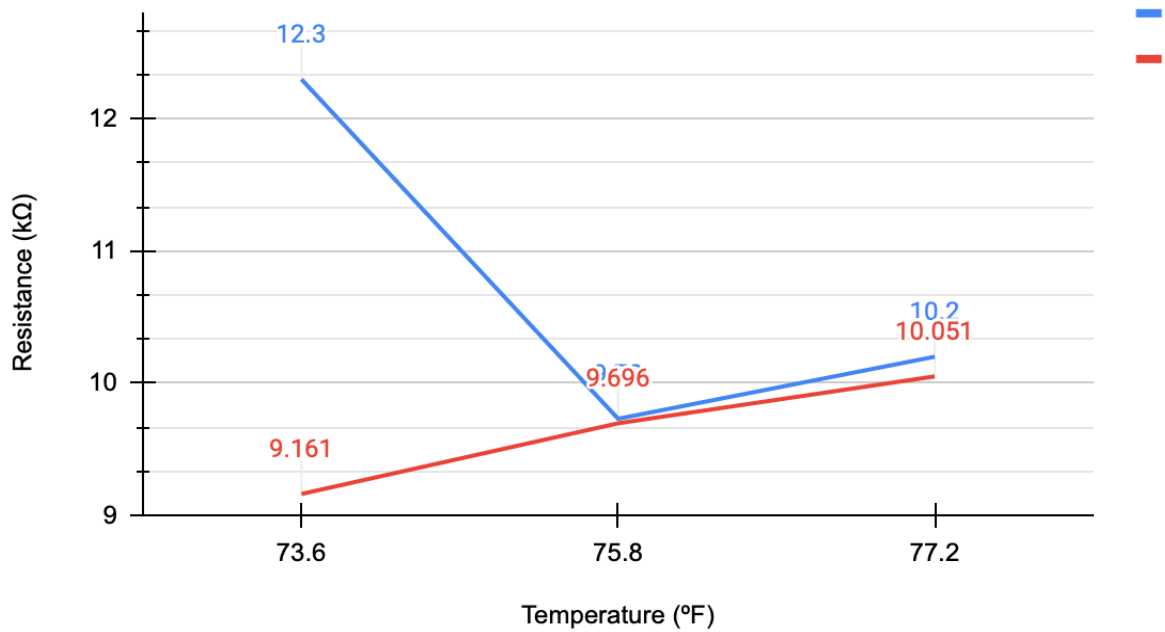
(2)

Measurements of 47(k Ω) Resistor



(3)

Thermistor resistance at different Temperatures



(4)

1. Provide an appropriate discussion of the measurements, plots, and tables (using cross-references) including equations used in calculations. Note: only complex equations (like the thermistor equation) need to be formatted on a separate line with an equation number.
 - a.
2. Discuss the histograms of the three resistors in terms of the nominal expected value and the tolerance.
 - a. The measured resistance of the $680\ \Omega$ resistor had the most variety of measurements (Fig. 1) while still maintaining the $\pm 5\%$ threshold for the resistor. Although many measurements remained below the nominal value. This is also true for the $47\ \text{k}\Omega$ measurements as well (Fig. 3). As for the $1\ \text{k}\Omega$ resistor measurements (Fig. 3) some measurements remained precise to the nominal value while many remained in the lower portion of the $\pm 5\%$ threshold.
3. Discuss the classes measured values for the thermistor compared to the theoretical curve.
 - a. From Figure 4 and Table 2 it is evidenced that the theoretical curve is a lot more linear compared to the actual measurements. The theoretical values supposed that at a lower temperature the resistance would be lower than expected but when measured in lab the results proved that at a colder temperature the resistance was greater than that at the hotter temperature. The Hot and Room Temperature measurements were more precise to the theoretical values compared to the theoretical values of the cold temperature and its measured result.

Conclusion:

From the data gathered during the laboratory experiment the results show the reaction of temperature correlates with the resistance measured. When measuring the resistance of the thermistor in colder temperatures the resistance measured increases compared to the resistance measured when the thermistor is at a higher temperature as seen in table 2. As for the resistance measured on each resistor is varied based upon the nominal values. Each resistor measured is within bounds of $\pm 5\%$ of the nominal value expected as evidenced from Table 1 and Figures 1, 2 and 3. While typically the values varied to the lower portion of that threshold each resistor's value is within its tolerance scope.