## References


1. T.Shield. (2013, November 22). *Least Squares Fit with Uncertainty*. Retrieved from Aerospace Engineering and Mechanics: http://www.aem.umn.edu/cgi-bin/shield/lsq-uncert.pl


## Sample Calculation

This is the conversion calculation from voltage to load in pound force with uncertainty.

$$P = VC * V = 265 * 0.035 = 22.96 \pm 5 + 0.04 * 22.96 = 23 \pm 6\ (lb_f)$$

This is the conversion calculation from pound force to newtons with uncertainty.

$$P = (23 \pm 6)(lb_f) * 4.44822(N/lb_f) = 100 \pm 30\ (N)$$

From figure 3 the light intensity minima were found and used to determine the corresponding load. For multiple load values that corresponded to an intensity minima the average of the load values was calculated.

| Intensity minima | P (N) | Uncertainty (N) |
|---|---|---|
| 101 | 150 | 30 |
| 101 | 160 | 30 |
| 101 | 160 | 30 |
| 101 | 160 | 30 |
| 101 | 160 | 30 |

Table 8. Values for an intensity minimum and corresponding load values and uncertainty.

Calculation for average load at an intensity minimum, values from tables 8.

$$P = (150 + 160 + 160 + 160 + 160)/5 = 160 \pm 30\ (\mathrm{N})$$

Plot of load versus fringe number figure 4, using online linear regression program calculated the value of the slope and uncertainty in table 3.

This is the calculation of material constant with values of the slope and dog-bone width from table 3 and table 1 respectively.

$$f_\sigma = \frac{slope}{w} = \frac{220}{0.0318} = 6918.24 = 6900\ (N/m)$$

This is the uncertainty calculation for material constant.