Physics 101

Lab 13: Hooke's Law

Myat Thit Ko Ko

Date: 05/14/2026

Contents

Purpose

The purpose of this thirteenth lab is to obtain practical skills in performing an experiment to attest the Hooke's law through the use of two springs.

Members

This lab group consisted of four members who worked together as a team to make the procedure accurate and fair for everyone.

1. Myat Thit Ko Ko (author)
2. Sarah Ruelas
3. Inigo Mikael Dela Vega
4. Hector Torres

Procedure

The lab consisted of the following steps and procedures.

Part I: Spring Constants

- Stacking weights, measuring height difference, producing a graph with slope K value
- Timing 10 oscillations, calculating K from slope obtained with period squared against x

Part II: Springs in Series

- Stacking weights, measuring height difference, producing a graph with slope K value

Part III: Springs in Parallel

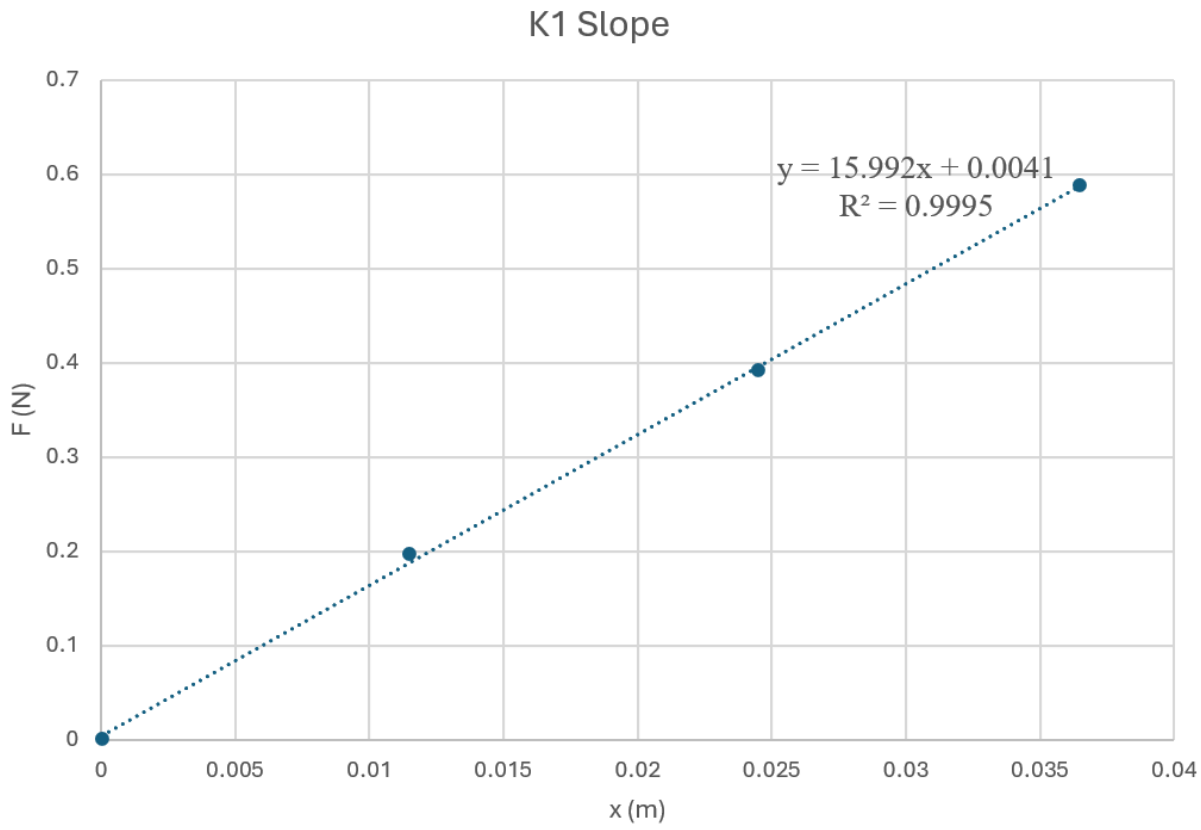
- Stacking weights, measuring height difference, producing a graph with slope K value

Data & Analysis

Part I: Spring Constants

K1

m (kg)	x (m)	F (N)
0.020	0.0115	0.196
0.040	0.0245	0.392
0.060	0.0365	0.588

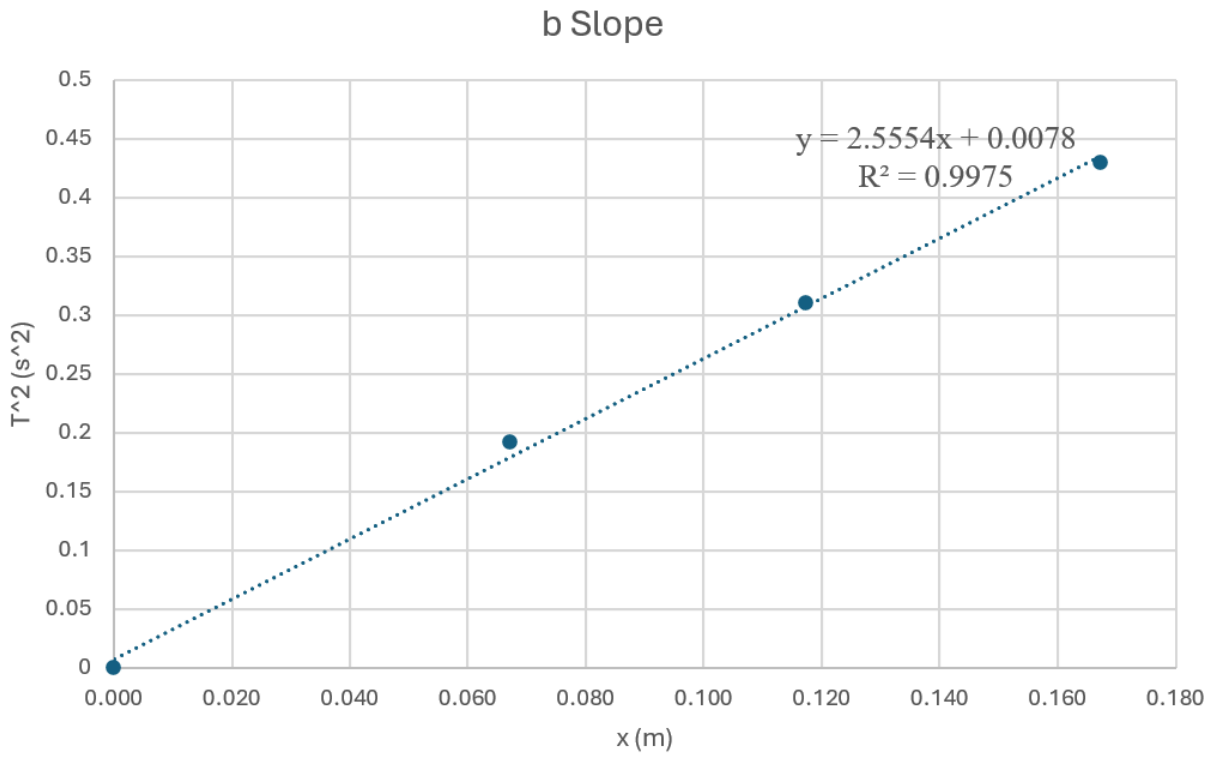


$$K_{1\,exp} = 16.0\,\frac{N}{m}$$

K1 Oscillation

Mass of hanger = 0.0173 kg

stacks (kg)	m (kg)	t for 10 oscil	T(s)	T^2 (s^2)
0.05	0.067	4.38	0.438	0.191844
0.1	0.117	5.565	0.5565	0.309692
0.15	0.167	6.55	0.655	0.429025

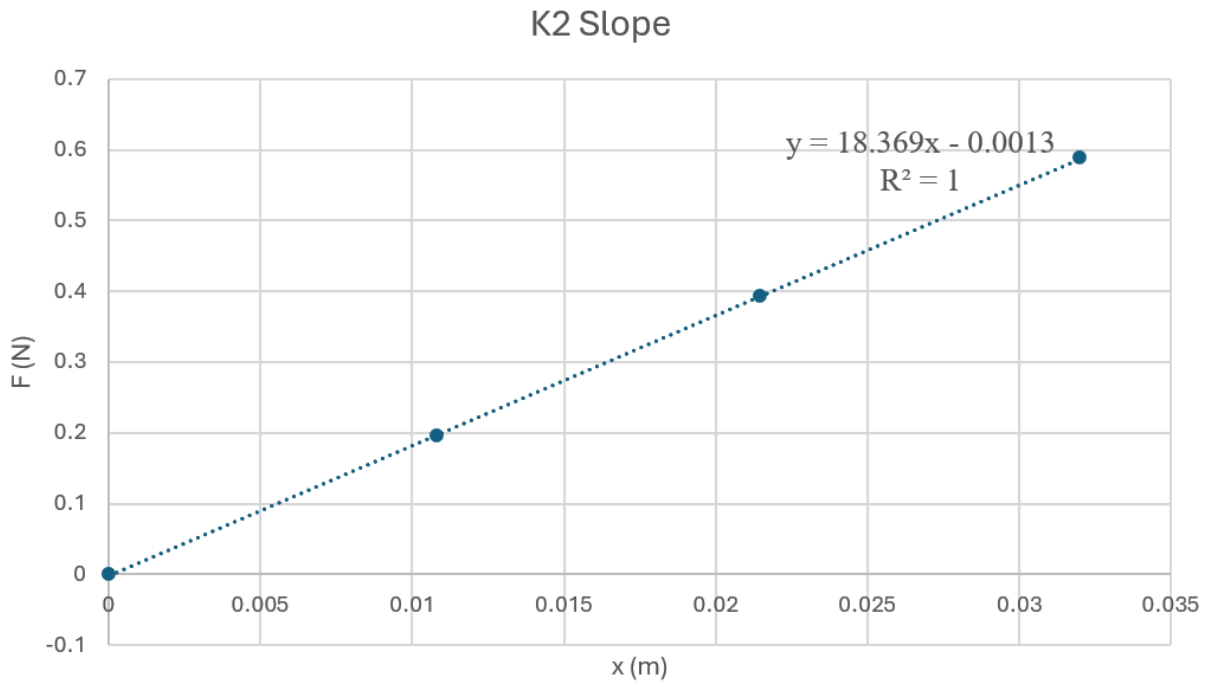


$$K_{1\,theo} = \frac{4\pi^2}{b} = \frac{4\pi^2}{2.56} = 15.4\,\frac{N}{m}$$

$$error\,\% = \frac{\left|K_1^{theo} - K_1^{exp}\right|}{\frac{K_1^{theo} + K_1^{exp}}{2}} \times 100\% = \frac{\left|15.4\frac{N}{m} - 16.0\frac{N}{m}\right|}{\frac{15.4\frac{N}{m} + 16.0\frac{N}{m}}{2}} \times 100\% = 3.82\,\%$$

K2

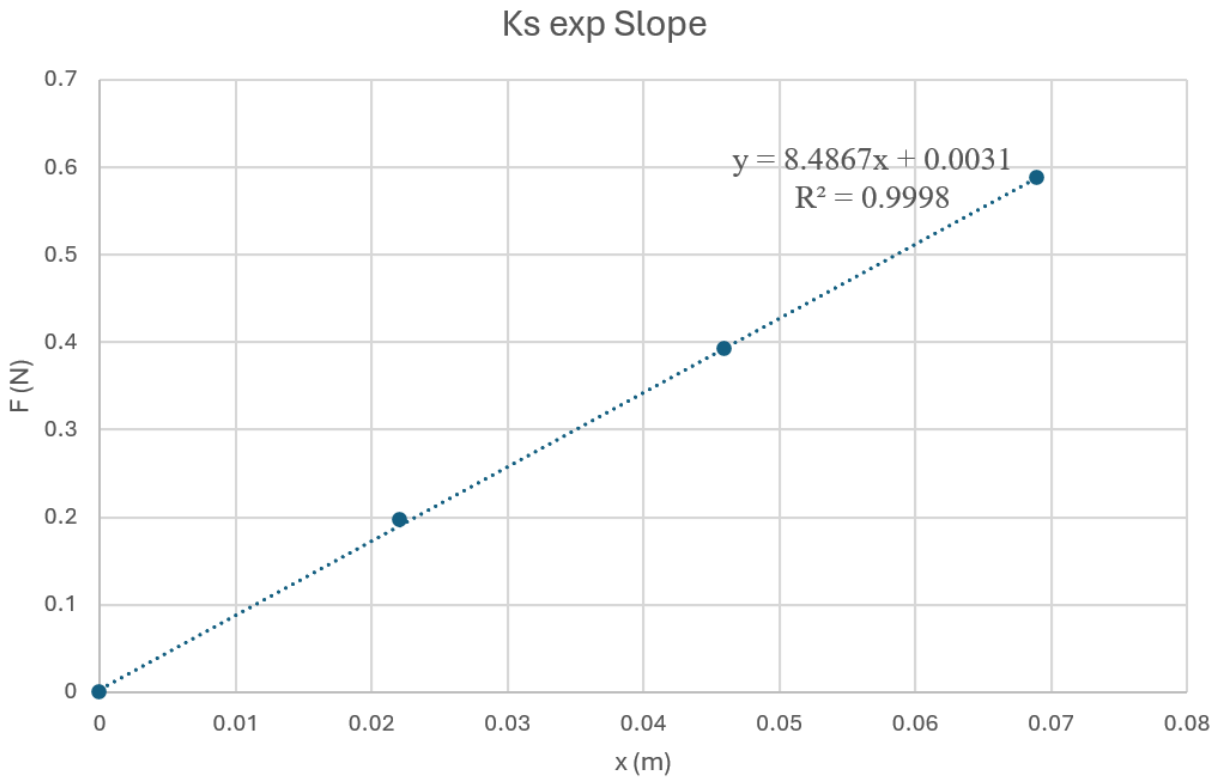
m (kg)	x (m)	F (N)
0.020	0.0108	0.196
0.040	0.0215	0.392
0.060	0.032	0.588



$$K_2 = 18.4\frac{N}{m}$$

Part II: Springs in Series

m (kg)	x (m)	F (N)
0.020	0.0221	0.196
0.040	0.046	0.392
0.060	0.069	0.588



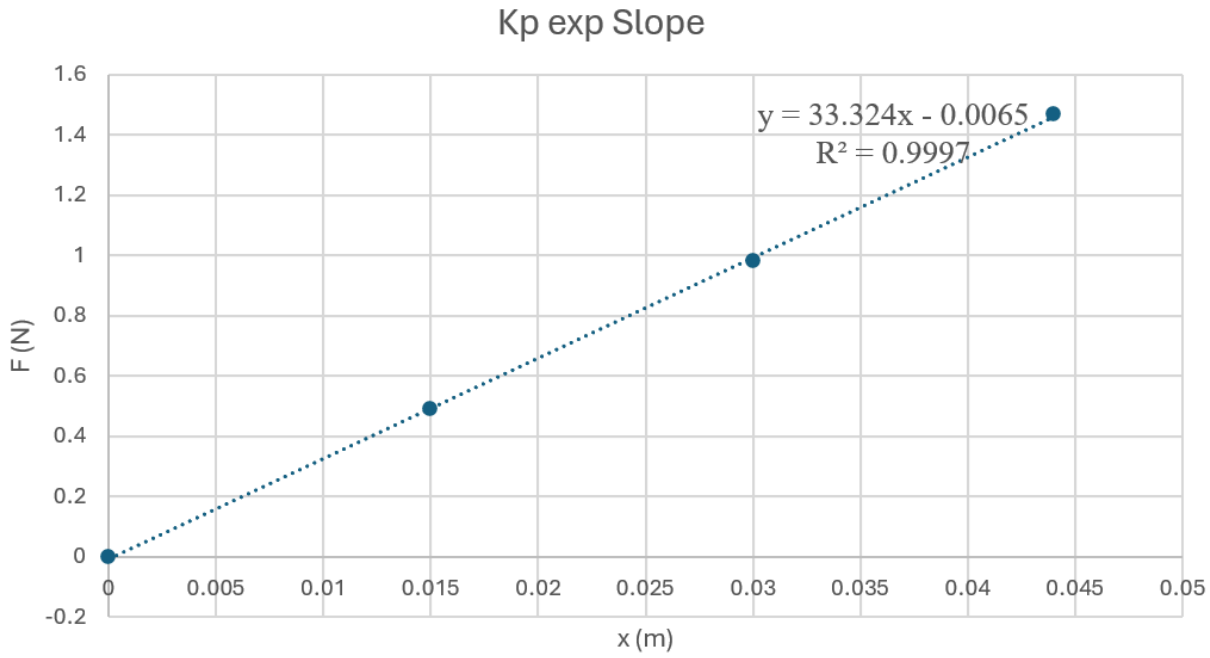
$$K_{s\,exp} = 8.49\frac{N}{m}$$

$$K_{s\,theo} = \left(\frac{1}{K_1} + \frac{1}{K_2}\right)^{-1} = \left(\frac{1}{16} + \frac{1}{18.4}\right)^{-1} = 8.56\frac{N}{m}$$

$$error\,\% = \frac{\left|K_s^{theo} - K_s^{exp}\right|}{\frac{K_s^{theo} + K_s^{exp}}{2}} \times 100\% = \frac{\left|8.56\frac{N}{m} - 8.49\frac{N}{m}\right|}{\frac{8.56\frac{N}{m} + 8.49\frac{N}{m}}{2}} \times 100\% = 0.821\%$$

Part III: Springs in Parallel

m (kg)	x (m)	F (N)
0.050	0.015	0.49
0.100	0.03	0.98
0.150	0.044	1.47



$$K_{p\ exp} = 33.3\frac{N}{m}$$

$$K_{p\ theo} = K_1 + K_2 = 16\frac{N}{m} + 18.4\frac{N}{m} = 34.4\frac{N}{m}$$

$$error\ \% = \frac{\left|K_p^{theo} - K_p^{exp}\right|}{\frac{K_p^{theo} + K_p^{exp}}{2}} \times 100\% = \frac{\left|34.4\frac{N}{m} - 33.3\frac{N}{m}\right|}{\frac{34.4\frac{N}{m} - 33.3\frac{N}{m}}{2}} \times 100\% = 3.25\%$$

Analysis

All error percentages were below 5%. Springs in Parallel have a much higher error percentage compared to springs in series. This is likely due to the difficulty of setting up perfectly parallel springs whereas connecting springs in series was relatively easy.

Conclusion

Since error percentages were found to be less than 10%, this lab is deemed satisfactory.

Summary

Experiment Title: Hooke's Law

Student's name: Myat Thit Ko Ko

Date: 05/14/2026

Purpose: To attest Hooke's Law

Procedure: Stacking weights, timing oscillations, measuring spring constants

Data: 5x3 = 15 sets total

Analysis: Error percentages were 3.82%, 0.821%, and 3.25% respectively.

Conclusion: Satisfactory