

Coefficients of friction

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Experiment Overview

Friction plays an important role in many technical devices and surfaces. It is, thus important for students of physics and engineering to be aware of the different types of friction forces, such as static friction, kinetic friction, rolling friction and fluid resistance. This experiment deals with kinetic friction between two surfaces and how it can be measured in the laboratory. It provides by means of a rather simple experiment a link between the theoretical aspects of friction which are developed in lectures and a hands-on experiment to show how friction can be measured in a laboratory situation. The experiment also provides students with an introduction to statistical techniques used to describe the results of experiments.

Learning Experience

Students usually have difficulties with the concept of force and frictional forces which act on a body when it is moving. This experiment provides students with a rather simple means of understanding the forces that are acting on a body that is moving. It provides them with a means of using the equations of motion with frictional forces for determining the coefficient of kinetic friction between two surfaces.

Aims and Objectives

The aims of the experiment are:

- (i) to determine the coefficient of kinetic friction between two surfaces
- (ii) to describe the results of the experiment in terms of statistical techniques.

The objectives of the experiment are:

- (i) to understand the concept of force in physics and engineering
- (ii) how to use Newton's laws to solve problems involving forces that act on a body
- (iii) to understand the nature of the different types of friction forces.

Level of Experiment

First-year engineering

Keyword Descriptions of the Experiment

Domain

Motion, friction

Specific Descriptors

Coefficients of friction, coefficient of kinetic friction, mean, standard deviation, standard error of the mean, Newton's laws, types of friction forces

Course Context and Prerequisite Knowledge and Skills

Measurements & Units, linear & circular motion, application of Newton's laws, work, energy & conservation law, angular momentum & rotational motion, fluid dynamics, Periodic motion, vibration & wave motion, physical optics, electricity & magnetism, Photons, electrons & atoms, thermal properties of matter & sustainability of materials, molecular structure, condensed matter and nuclear physics, HSC physics and HSC mathematics.

Time Required to Complete

Prior to Lab: 45 minutes

In Laboratory: 2 hours

After Laboratory: none

Experiment History

The experiment has been developed by academic staff in the School of Engineering over a number of years.

The experiment has been modified and students can do the analysis of the experiment by Excel and as an option on MatLab

Comments

The experiment lends itself for doing the analysis of their results on MathLab which they study in their first year. It provides a good hands-on experience to do an experiment and use the MathLab software.

References

Bhathal, R. 2011. *Physics and Materials: Laboratory Projects Manual*. University of Western Sydney.

Young, H. G., Freedman, R. A. And Bhathal, R. *University Physics with Modern Physics*. 1st Australian SI Edition. Pearson.