

Physics 161
Lecture 6
Applying Newton's Laws

September 21, 2017

Lecture 6: learning objectives

This lecture

You will be able to draw free-body diagrams for physical systems.

You will be able to apply Newton's second law to systems involving one or two objects, both in equilibrium and accelerating.

You will be able to apply the concepts of kinetic and static friction to single- and multiple-body problems.

General Force Facts

Equilibrium:

Objects are in equilibrium when the net force acting on them is zero.

$$\vec{F}_{\text{net}} = 0$$

Objects in equilibrium are either at rest or move with constant velocity.

The tension in a massless rope is the same at all points in the rope.

Friction

There are two types of friction force: **static** and **kinetic**

Coefficient of static friction:

Constant of proportionality between normal force and force due to static friction.

$$F_S \leq \mu_S N$$

Coefficient of kinetic friction:

Coefficient of proportionality between normal force and force due to kinetic friction.

$$F_K = \mu_K N$$

We neglect any variation of kinetic friction with speed.