

# PH201 Reading Week 4

## Chapter 4: Forces and Newton's Laws of motion

We have spent the first three weeks and a day describing motion – 1D, projectile, circular...- which we can lump together under the label *kinematics*. You have learned how acceleration affects motion. Now we come to the *cause* of motion: force. Can you see that we are slowly building up to the bigger picture? This new topic falls under the heading *dynamics*. Combine *dynamics* and *kinematics* and you get *mechanics*: “the general science of motion.” After your reading and discussion in class, I envision you will be able to tell your friends and family what force is, how force and motion are related, and how forces between different objects are related.

### Student Learning Objectives

In covering the material of this chapter, students will learn to:

- Recognize what does and does not constitute a force.
- Understand a basic catalog of forces and how they act.
- Identify the specific forces acting on an object.
- Draw an accurate free-body diagram of an object.
- Begin the process of understanding the connection between force and motion.
- Understand the relationship between forces between two different objects.

### Some questions that successful students can answer after reading the text

What causes motion?

What do we mean when we talk about *dynamics*? *Kinematics*? *Mechanics*?

What is Newton's first law?

If an object has no force acting on it and is at rest, describe its motion.

What is the difference between long-range and contact forces?

What do we mean when we say “net force”? How is this different from regular forces?

What is the particle model? How does one draw force vectors in the particle model?

Name 8 different types of forces that could act on an object.

What direction does the weight force always point?

What is the difference between weight and mass?

What is a normal force?

In what directions do the following forces act? Spring force? Tension force? Normal force? Frictional force?

What is the difference between kinetic and static friction?

What is drag and what direction does it point?

What is thrust and what direction does it point?

What are noncontact forces?

What is the best way to identify the forces on an object?

How is acceleration related to force?

How is acceleration related to mass?

What is Newton's second law?

What are the SI units of force? Other units?

What is a Free Body Diagram (= force diagram)?

What is Newton's third law?

Is friction always opposite to your direction of motion?