# Topics for today:

* Vibration in simple mass-spring systems.
  + A spring may be thought of as a helix of wire, like a suspension spring in the undercarriage of a truck, or it may be a taut string or stiff rod attached at one or both ends.
  + If we compress or stretch the spring, it responds by exerting a corresponding *restoring force* in the opposite direction, trying to spring back to its original position. The amount of force is proportional to the amount of compression or extension. If we compress by an amount x, the force is – *k* x, where k is the “spring constant” and the negative sign indicates the force is in opposition to the direction of displacement.

Spring force = - *k* x

* + The units of the spring constant, k, are newtons per meter [N/m]. Different springs will have different spring constants. A very stiff spring has a large k, and a weaker spring has a small k.
  + The predicted frequency of oscillation of a mass-spring system is

Frequency [Hz] = sqrt(k/m) / (2 pi)

* + The stiffer the spring, the higher the natural vibration frequency. The greater the mass, the lower the natural vibration frequency.
  + If there are mechanical losses and friction, the natural vibration frequency is lower than the undamped natural frequency, and the oscillation gradually dies out.
* Energy and Power discussion
  + Energy (joules) is a measure of the ability to do useful work: move an object against a force.
  + Power (watts) is a measure of the *rate* that energy is used. Joules per second.

# Topics for the next lecture:

* More on energy and power.
* Start consideration of wave motion in the air.
* Quiz on chapters 3, 4, and lecture material.