

ENSC 2113

Engineering Mechanics: Statics

Lecture 27
Section 8.1

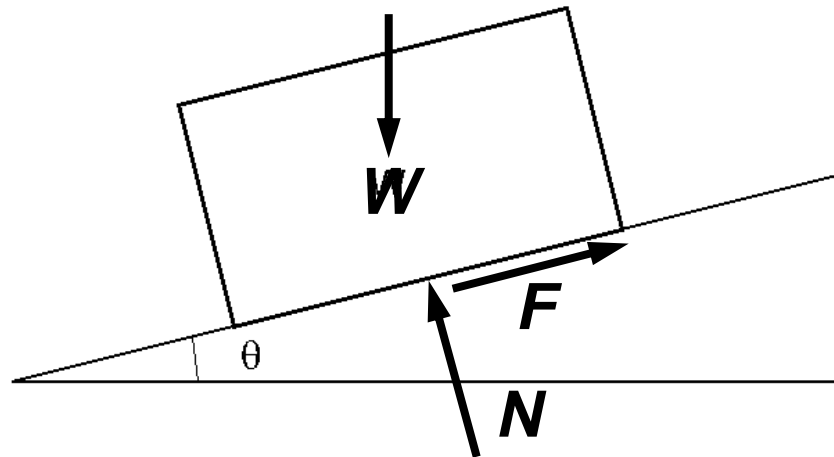
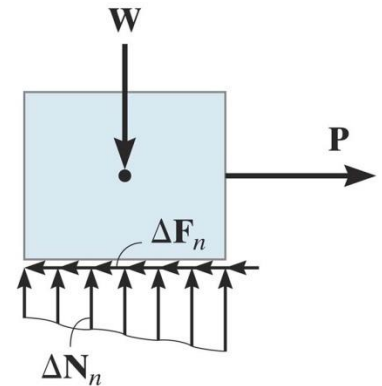


College of Engineering, Architecture & Technology

8.1 - 8.2: Friction

Friction: Force of resistance on a body which prevents (**static**) or impedes (**kinetic**) motion.

Friction acts parallel to the contact surface.



where,

W = weight of body

N = Normal force

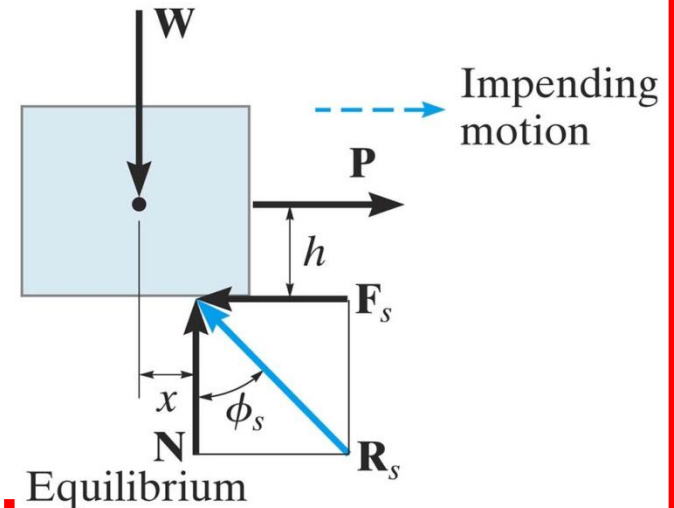
F = Friction force

Friction Equations:

The general eqns of *Static* and *Kinetic* friction are as follows:

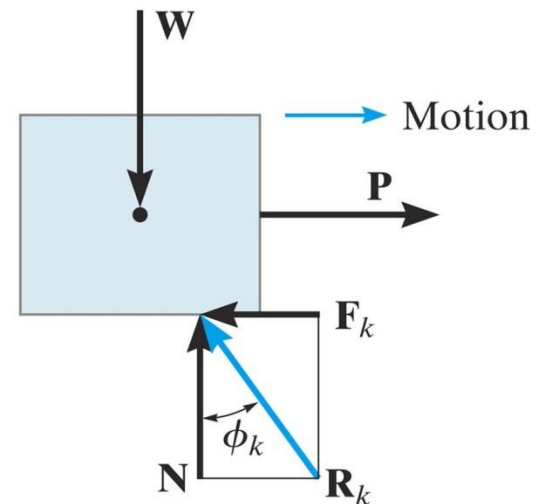
$$F_s = \mu_s N \quad (\text{Static - at rest})$$

(Figure 8-1)



We will consider *Static* conditions ...

$$F_k = \mu_k N \quad (\text{Kinetic - in motion})$$



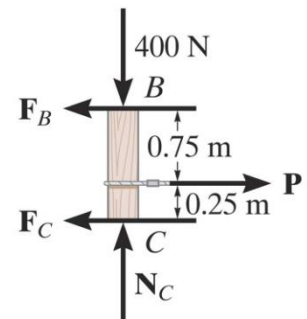
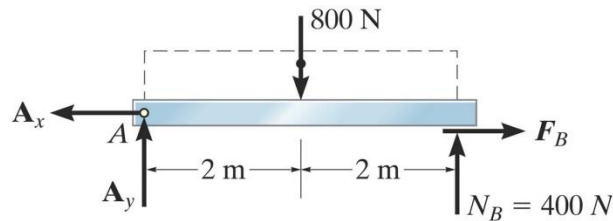
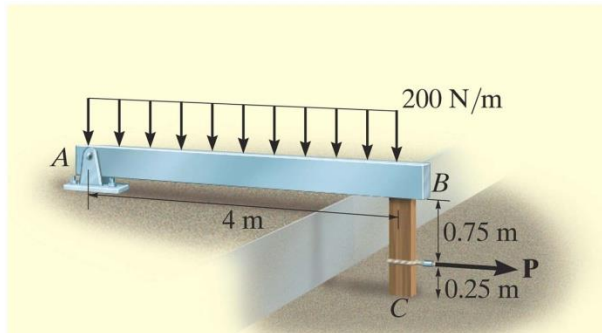
Coefficient of Friction - Two Conditions:

Static coefficient of friction resists initial movement of a body.

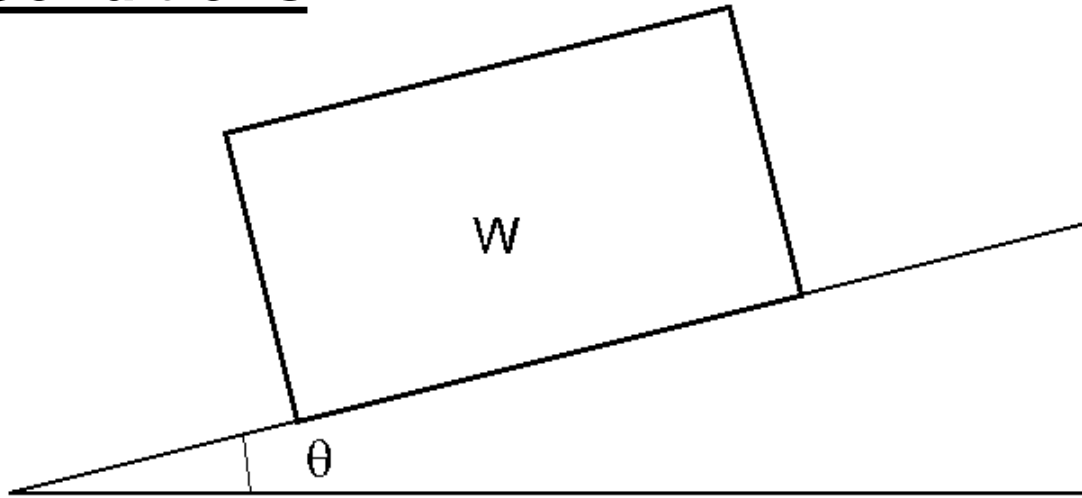
Kinetic coefficient of friction impedes movement once begun.

Typically, the static coefficient of friction is about 25% more than the kinetic coefficient of friction.

Friction always works in a direction opposite that of impending motion of a rigid body.



Friction Conditions:



There are 3 possibilities for the condition shown:

1. Body is in equilibrium and does not move.
2. Maximum possible friction force is exceeded and box will slide down the incline.
3. Center of gravity is located such that the box will tip.

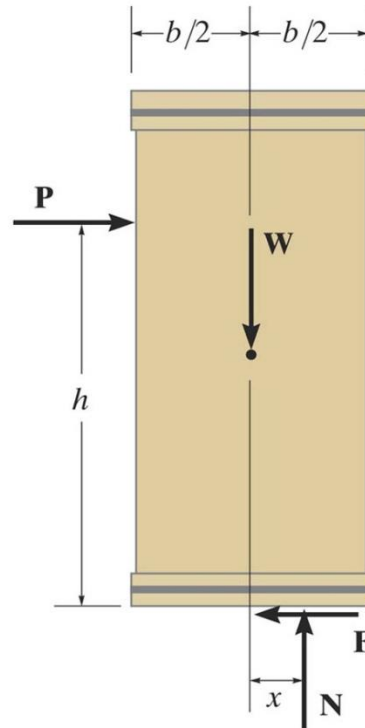
*For all friction problems, draw the **FBD** and apply the equilibrium equations*

Tipping Condition:

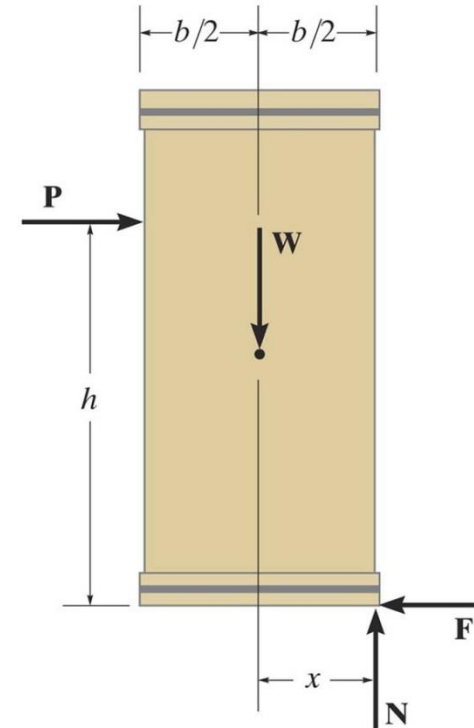
Similar to the overturning problems we saw when dealing with water pressure.



Actual condition



Friction controls



Tipping controls

*If normal force **N** moves to corner of object, tipping will occur .*

ENSC 2113

Engineering Mechanics: Statics

Lecture 27
Section 8.1



College of Engineering, Architecture & Technology