Course Code: ESC106A
Course Title: Construction Materials and Engineering Mechanics

Lecture No. 46:
Block Friction and Related Problems

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Lecture Intended Learning Outcomes

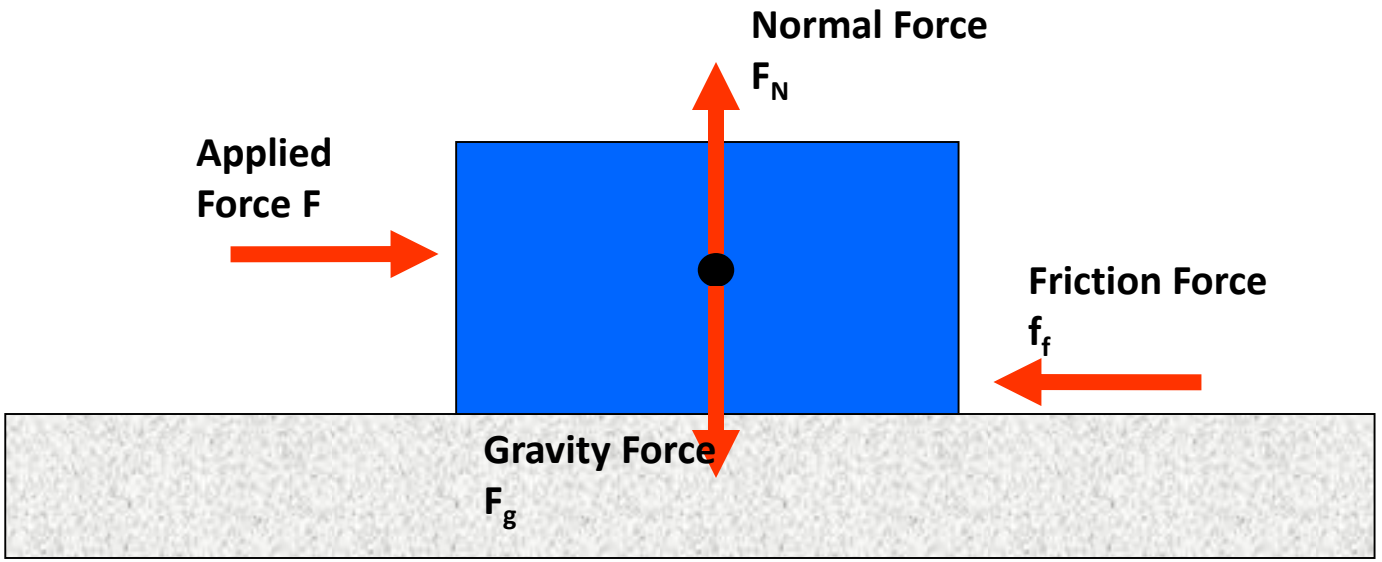
At the end of this lecture, students will be able to:

- Define Block friction and understand block friction
- Draw Free Body diagrams of Blocks in the given problems
- Evaluate frictional forces or weight of the block or find tension in the string connecting the blocks by assuming impending state of the block

Contents

- Mechanism of block friction
- Generating free body diagrams for blocks
- Numerical problems on block friction

Block Friction



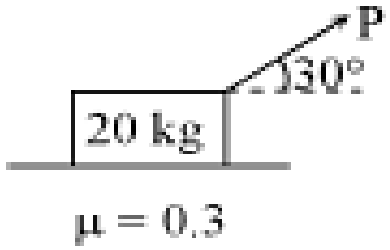
$$F_g = mg$$

$$F_N = F_g$$

$$f_f = F$$

Block Friction: Problem 1

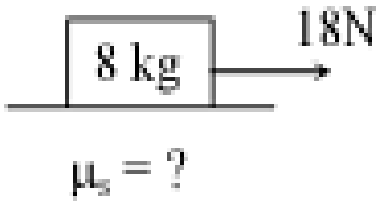
Example: Find the force P needed to just move the block of weight 20 kg to the right. Take μ_s as 0.3



Ans: P=58.04kN

Block Friction: Problem 2

Example: A minimum horizontal force of 18N is required to move the 8 kg block to the right on a flat horizontal surface. Find the coefficient of friction between the block and the floor.

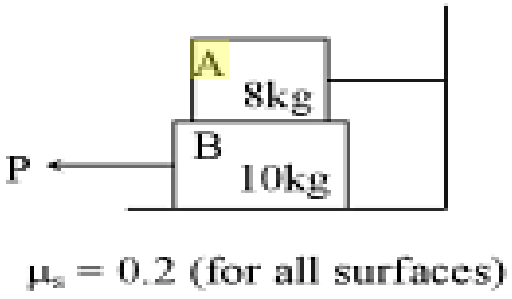


Ans: Fs=18N

μ_s=0.229

Block Friction: Problem 3

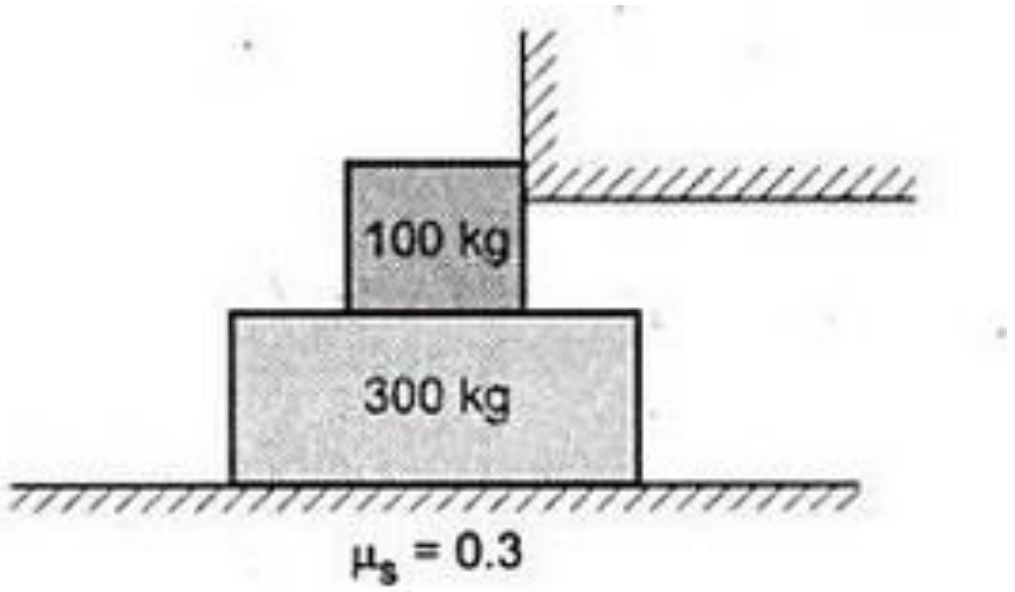
Example: Find the magnitude of force P required to just move the block B having mass 10 kg. Block A having mass 8 kg is placed on block B and is restrained by a string connected to a rigid wall. Take coefficient of friction for all contact surfaces as 0.2. T is the tension in the string and N is the normal reaction between block B and the surface



Ans: T=15.69N
N=176.58N
P=51.27N

Block Friction: Problem 4

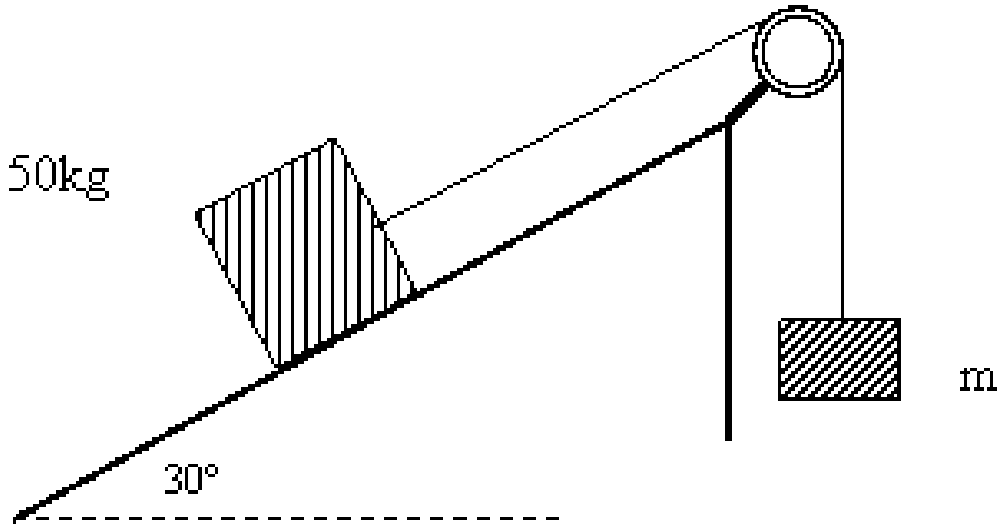
Example: If coefficient of friction between all surfaces shown in figure is 0.30. What is the horizontal force required to get 300kG block moving to the right?



Ans: P=1471.5 N

Block Friction: Problem 5

Example: A *50kg* block is on an inclined plane of 30°. The coefficient of static friction between the block and the plane is 0.3. We wish to determine the range of *m* under the block will be in equilibrium.



Ans: m1=12kG
m2=38kG

Summary

- Friction is the force resisting the relative motion of solid surfaces, fluid layers and material elements sliding against each other
- Based on the concept of friction the sliding problems are solved