Georgia Institute of Technology

Applications in Engineering Mechanics

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This course addresses the modeling and analysis of static equilibrium problems with an emphasis on real world engineering systems and problem solving.

School of Mechanical Engineering

Applications in Engineering Mechanics Overview

Equilibrium of Rigid Bodies
Review “Introduction to Engineering Mechanics”

Structural Applications
Frame/Machines
Plane Trusses
Space Trusses
Cables

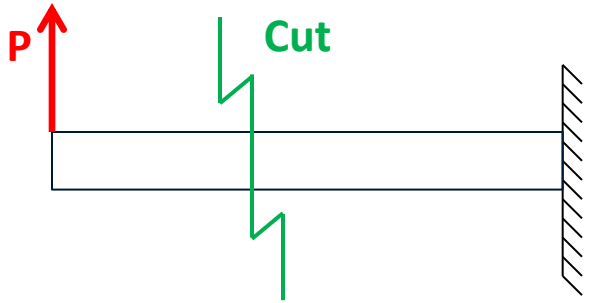
Internal Forces in Beams
Shear Force and Bending Moment Diagrams

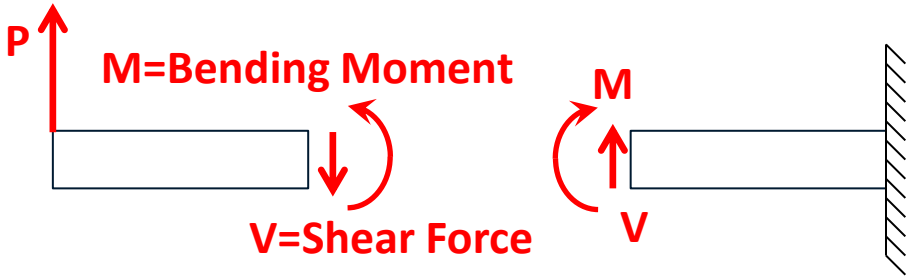
Effects of Friction on Static Equilibrium
- Impending slipping
- Impending tipping

Module 14 Learning Outcomes

- Determine Internal Shear Forces and Bending Moments in multiforce members.
- Sketch a Shear Force Diagram for a multiforce member

Internal Forces and Bending Moments in Multiforce Members





Sign Convention

Shear Force

Positive
(CW on Material)

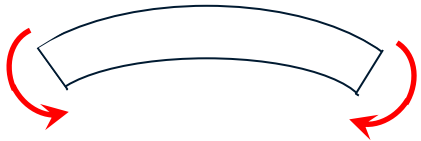
Negative
(CCW on Material)

Bending Moment

Positive

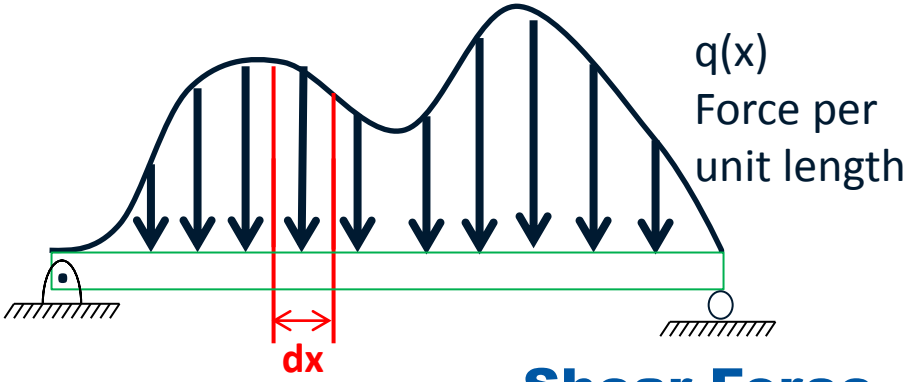
Smiley Face

Negative



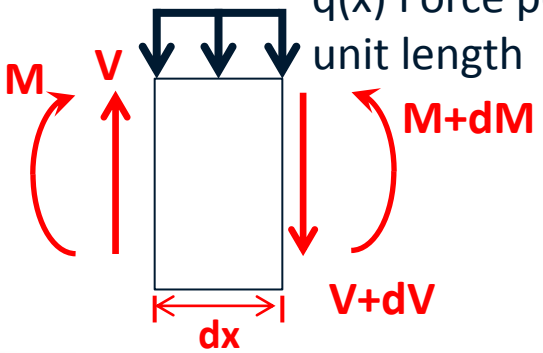
Frowny Face

Differential Beam Element



The negative value of the load at a point equals the slope (rate of change) of shear diagram

Shear Force

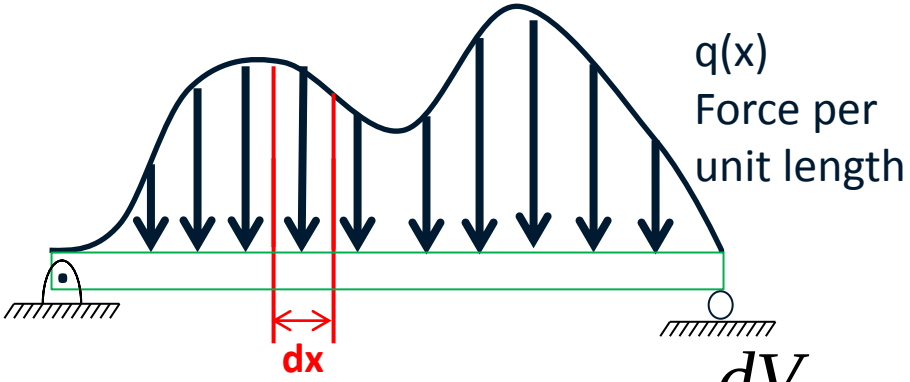


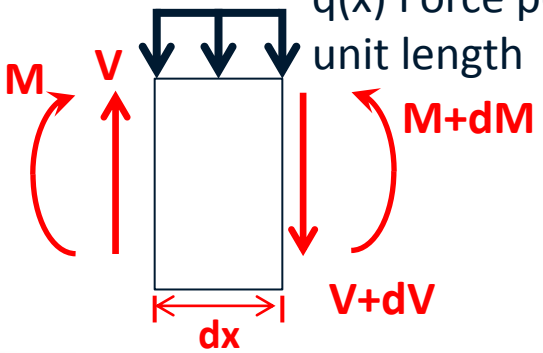
$$\sum F_y = 0$$

$$V - q\,dx - V - dV = 0$$

$$-q = \frac{dV}{dx}$$

Differential Beam Element





$$-q = \frac{dV}{dx}$$

$$\int_{V_1}^{V_2} dV = -\int_{x_1}^{x_2} q\ dx$$

$$\Delta V = -\int_{x_1}^{x_2} q\ dx$$

The change in shear between two points equals negative the area under the load curve