Class Structure

- Three Modules
- Three in-class 75 minute exams
- Comprehensive final exam

Grades
- Exams
- On-line HW
- Paper HW
- Team Projects
- Participation

Coverage

- New Topics
  - Module 1
    - Statics and Material Behavior
    - Fluid Mechanics
  - Module 2
    - Oscillatory Motion
    - Waves
    - Sound
  - Modules 3
    - Thermodynamics

Some Things That Are The Same

- Structure
  - “Lecture”
  - “Recitation” – Project Time & Lab/PS

- Website
  - Used extensively to “run” the course
  - Lecture notes, reading assignments, etc.
  - HW Assignments
  - On-Line grades
  - Discussion board

Same ⇔ Different

- Help Sessions / Monitoring Discussion Board
- Yes, but the schedule may be different

- Grade system
- A-F instead of A-C, NC

- If you do better on the final, does that help?
- Yes
What is the Biggest Difference?

EF 158

Module 1: Statics
Material Behavior
Fluid Mechanics

Chapter 12 - Equilibrium

The net resultant force on a body = 0

The net resultant moment on a body = 0

Key to Success
Equilibrium - Eight Step Process
1) Decide what needs to be isolated. (may be the hardest part).
2) Draw the isolated (free) body (or bodies) complete with all external boundaries.
3) Choose a Coordinate System (C.S.).
4) Add all EXTERNALLY APPLIED forces & moments acting ON the Free Body.
   a) Given forces and moments including weight.
   b) Support reactions (where the body is cut from the rest of the world).
5) Add all necessary dimensions.
6) Enforce Equilibrium.
7) Solve the equilibrium equations for all unknowns.
8) Check work and answers for units, directions, proper notation, S.D., reasonableness, etc.

Example Problem
- **Given:** In the situation at right, a 50 lb pull on the handle of the hammer is required to remove the nail.

- **Required:** Calculate the tension \( T \) in the nail and the magnitude of the contact force at point \( A \) \( |F_A| \).

Example Problem Continued
Step 2: Draw FBD
Step 3: C.S.
Step 4: External Forces and Moments
Step 5: Dimensions
Step 6: Enforce Equilibrium

Step 7: Solve Equations

Step 8: Check Everything

Supports - 2 D

1. Flexible cable, belt, chain, or rope
   - Weight of cable negligible
   - Weight of cable not negligible
   - Force exerted by a flexible cable is always a tension away from the body in the direction of the cable.

2. Smooth surfaces
   - Contact force is normal to the surface.

3. Rough surfaces
   - Rough surfaces are capable of supporting a tangential component \( F \) (frictional force) as well as a normal component \( N \) of the resultant contact force \( R \).
Example Problem

**Given:** The 150 N squeeze applied to the pliers shown at right.

**Required:** Find force applied to the round rod and the magnitude of the force at pin A.

Step 1: What do we isolate?
Example Problem

Given: The 150 N squeeze applied to the wire cutters shown at right.

Required: Find force applied to the round wire and the magnitude of the force at pin A.

Step 1: What do we isolate?

Ex Problem

Step 2: FBD of ALL members
Step 3: C.S.
Step 4: Forces & Moments
Step 5: Dimensions
Step 6: Enforce Equilibrium for
Each FBD, 7 unknowns and 10 equations
Step 7: Solve equations
Step 8: Finish and Check

Ex Problem

Answer:

“Simple” wire cutter