Welcome to Statics

What Is Engineering MECHANICS?

• The BODY and/or the FORCES can be large or small.

Study of what happens to a “thing” (we call it a “BODY”) when FORCES are applied to it.

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What types of External forces do we study?

The study of external forces varies significantly by field

• civil and structural (self-weight, wind, seismic, support reactions, axial forces, bending moments)
• biomechanics (muscle and tendon forces)
• automotive (tire and steering forces)
• aerospace (lift and drag)
• robotics (control/actuator forces)
• machine design (contact and friction)

Engineering is the application of mathematics and science to meet human needs.

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Why are we interested in studying forces?

Forces can cause materials to deform and fail

Forces can cause things to move

Forces can restrain things from moving

Understanding forces allows us to

Design structures to support forces w/o failure or excessive deformation – bridges, buildings, artificial joints, car frames

Design machines that can apply a set of forces to a body w/o failure or excessive deformation – bolt cutters, transmissions, airplanes, manufacturing

Officially Engineering Mechanics is a science that describes and predicts the behavior of gas, liquid, or solid bodies under the influence of forces

Engineering Mechanics is the study of what happens to a “Body” when FORCES are applied to it.
With Statics, an engineer can determine the force acting at any location in a body using equilibrium relationships. With this force info, engineers can properly proportion, or “design” the body to resist the loads safely.

**Finite Element Structural Analysis**

Hell Gate Bridge, New York, 1916
Designed with NO COMPUTERS

**Micro Electromechanical Systems (MEMS)**

*Hexsil Tweezer*

- thermal expansion bar
- Linkage to amplify bar’s length change to control tweezer tip separation

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