1.050 Engineering Mechanics

Lecture 3: Dimension analysis and application to engineering structures

1.050 – Content overview

I. Dimensional analysis
  1. On monsters, mice and mushrooms
  2. Similarity relations: Important engineering tools

Lectures 1-3
Sept.

II. Stresses and strength
  2. Stresses and equilibrium
  3. Strength models (how to design structures, foundations.. against mechanical failure)

Lectures 4-15
Sept./Oct.

III. Deformation and strain
  4. How strain gages work?
  5. How to measure deformation in a 3D structure/material?

Lectures 16-19
Oct.

IV. Elasticity
  5. Elasticity model – link stresses and deformation
  6. Variational methods in elasticity

Lectures 20-31
Nov.

V. How things fail – and how to avoid it
  7. Elastic instabilities
  8. Plasticity (permanent deformation)
  9. Fracture mechanics

Lectures 32-37
Dec.

1.050 – Content overview

I. Dimensional analysis

II. Stresses and strength

III. Deformation and strain

IV. Elasticity

V. How things fail – and how to avoid it

D-Analysis of Tall Buildings

Graphic of tall buildings removed due to copyright restrictions.

http://www.joelertola.com/grfx/grfx_update_feb_05/tall_buildings.jpg

Hurricane Katrina

Wind speeds 200 km/h

Photograph of skyscraper removed due to copyright restrictions.
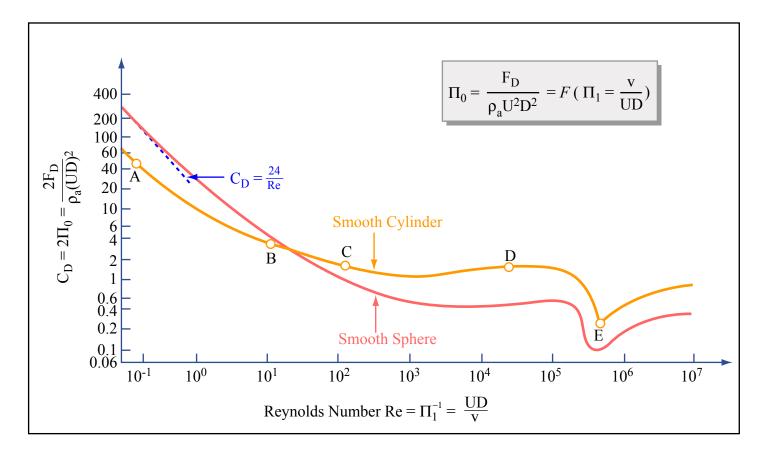
Lab Results: Drag Coefficient on smooth objects

Figure by MIT OpenCourseWare.