

Lecture 09: Plasticity

o Why study plasticity?

- When a material is strained (stressed) beyond its elastic limit, Hooke's law no longer applies.

- Structures may be subject to uneven loads, viz. Wings under heavy gust, buildings shaken by earthquakes, ship to storms, vehicles to collision accidents, etc

For these cases, the designers must assess the load-carrying capabilities of the systems such that they can continue to function under damaged conditions.

- Design examples that account for plasticity;

aircraft: must continue to fly even after undergoing plastic (large) deformations

automobiles: must protect passengers during the collision accidents

buildings: must stand during storm & earthquakes

- plasticity is essential knowledge for rolling, drawing, extrusion, metal cutting, stamping, forging, rock formation,

geophysics and geology, etc.

- who's who in plasticity: Tresca (1868), Saint-Venant (1871), Lévy (1871), Haas and von Kármán (1909), von Mises (1913), Hencky (1923), Prandtl (1921), etc.