Mechanics of Materials

Lecture 1 – Stress and Strain

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- **Aims**

❑ **To learn the method of sections for determining the internal loading(s) in a member.**

❑ **To learn the concepts of normal and shear stress. To use them in the analysis and design of members subjected to axial load and direct shear.**

❑ **To define normal and shear strain and utilize them to solve various types of related problems.**

- **Main References**

Statics and Mechanics of Materials, 3rd Edition, Russell C. Hibbeler 2011, Pearson

This lecture slides gives the idea on real applications based on the theory discussed in the class.

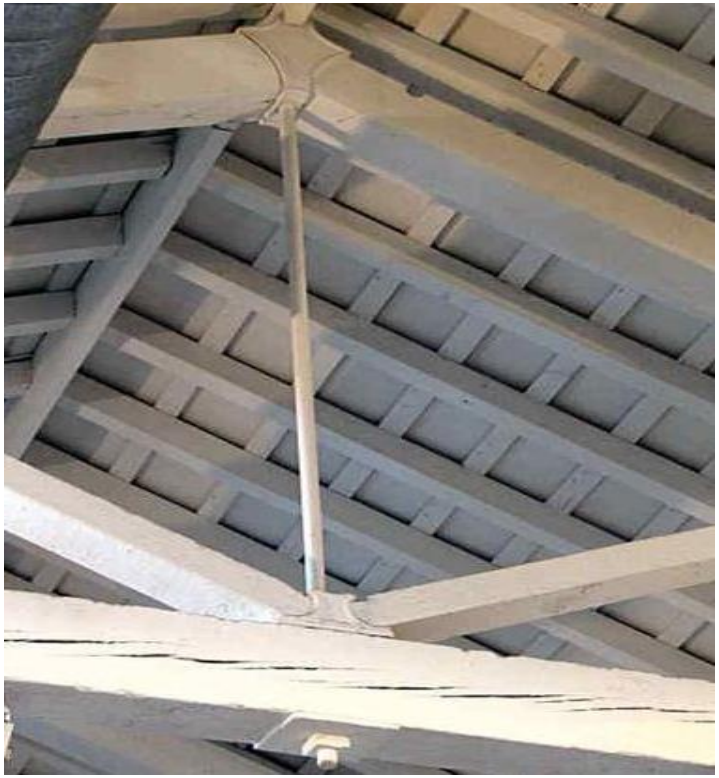
The bolts used for the connections of this steel framework are subjected to stress. In this lecture we will discuss how engineers design these connections and their fasteners.

Source: https://pixabay.com/en/construction-steel-metal-frame-196302/

To design the horizontal members of this bridge frame; it is first necessary to know internal loadings at various points along their length.

Source: https://en.wikipedia.org/wiki/Truss#/media/File:RRTrussBridgeSideView.jpg

This steel tie rod is used as a hanger as a result it is subjected to tensile stress.



Source: https://en.wikipedia.org/wiki/File:King_tie_rod.jpg

Appropriate factors of safety must be considered when designing cranes and cables. They are used to transfer heavy loads.

Source: https://pxhere.com/en/photo/548050

The concrete support is subjected to both normal and shear strain. The normal strain is caused by the weight and structure loads. The shear strain is caused by the horizontal movement of the structure due to temperature changes.

Source: https://commons.wikimedia.org/wiki/File:Precast_parking_structure.jpg