(Composite structures)

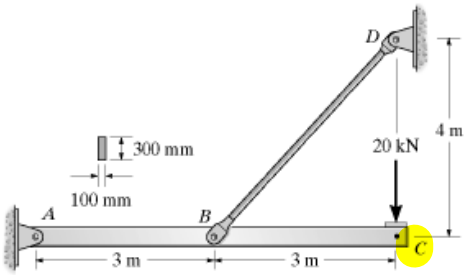
Lecture outline:

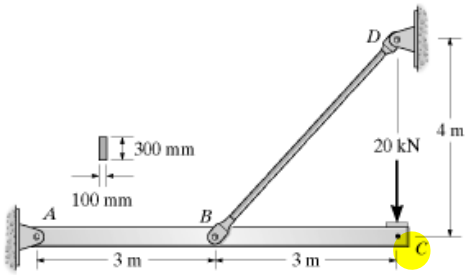
1. Determinate composite structures

1. **Determinate** composite structures - DISPLACMENTS

Sometimes a structure may be composed of some members that are primarily subjected to axial deformations (i.e. like truss members, cables) and other members that are primarily subjected to flexural deformations (i.e. like beam and frame members).

Composite structures – How to determine DISPLACEMENTS using Virtual work





Recall:

- For trusses → $1 \cdot \Delta = \sum \frac{nNL}{AE}$
- For beams → $1 \cdot \Delta = \int_0^L \frac{mM}{EI} dx$
- For composite structures? $1 \cdot \Delta = \int_0^L \frac{mM}{EI} dx + \sum \frac{nNL}{AE}$

Step 1 ... apply REAL loads

Axial member:

- Get member force = ***N***

Beam:

- Get ***M*** diagram

Step2 ... apply VIRTUAL unit load in direction of required displacement

Axial member:

- Get member force = ***n***

Beam:

- Get ***m*** diagram

Step 3 ... apply VW equation : $1 \cdot \Delta = \int_0^L \frac{mM}{EI} dx + \sum \frac{nNL}{AE}$