ENSC 2113
Engineering Mechanics: Statics

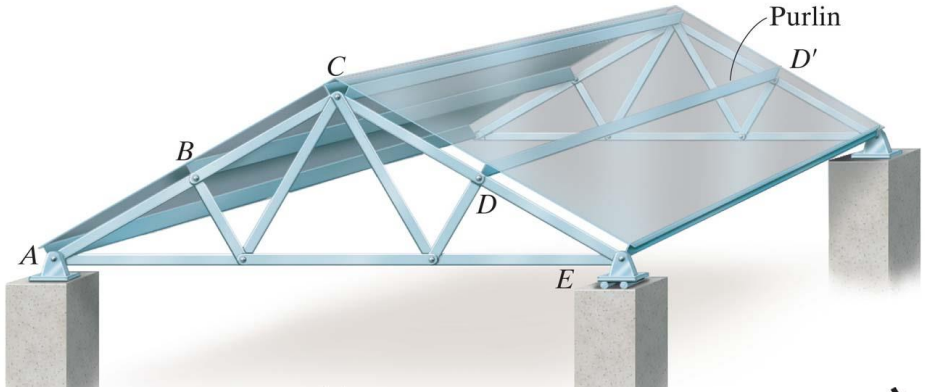
Lecture 20
Sections 6.1-6.3

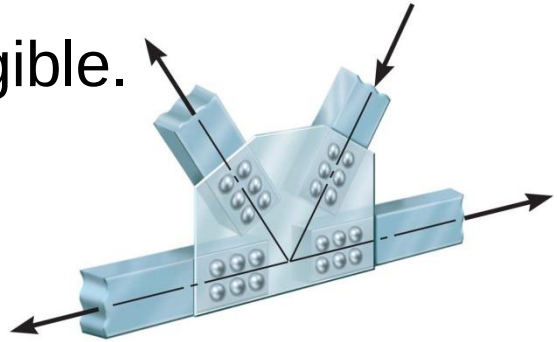
College of Engineering, Architecture & Technology

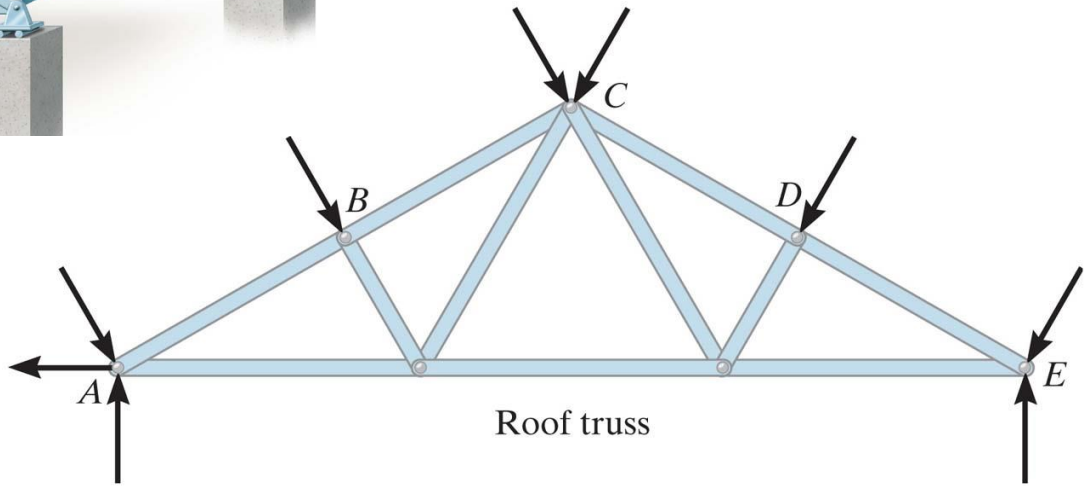
6.1: Simple Trusses

Simple trusses have the following assumptions:

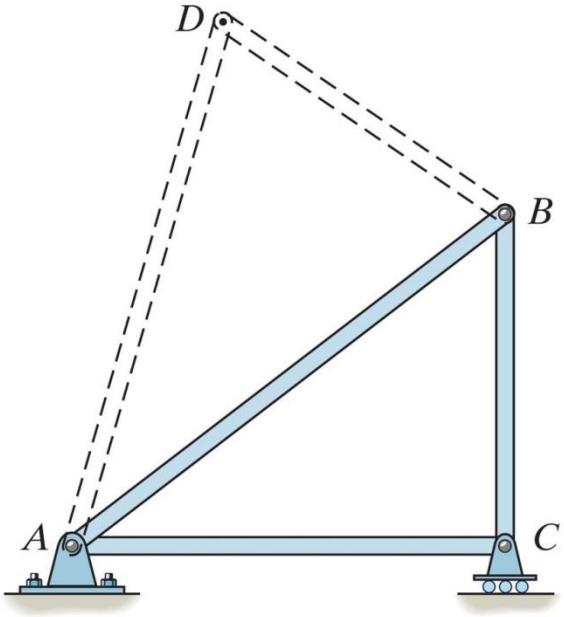
1. All members are two-force members.
2. All connections (joints) are pinned (no moment).
3. All loads applied at the joints.
4. Weight of truss members is negligible.



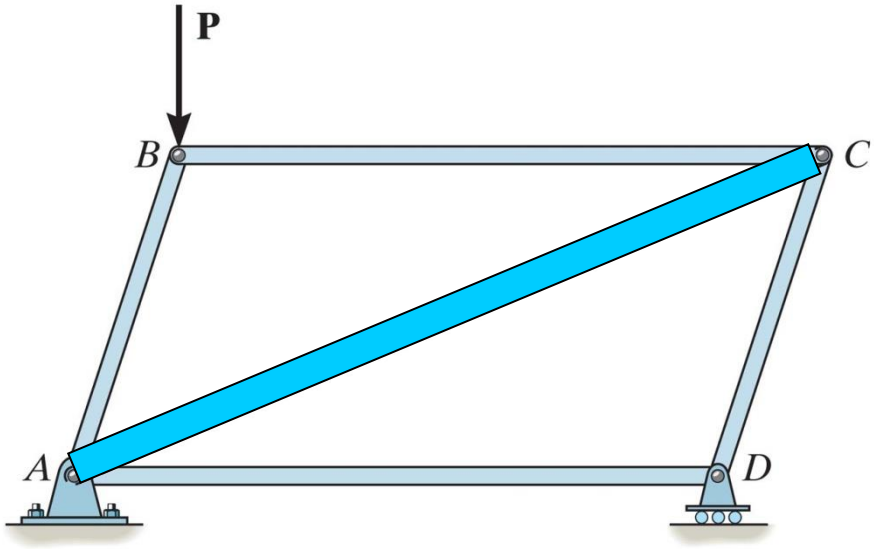




Simple trusses are made up of triangles which are stable and rigid.



Stable Element



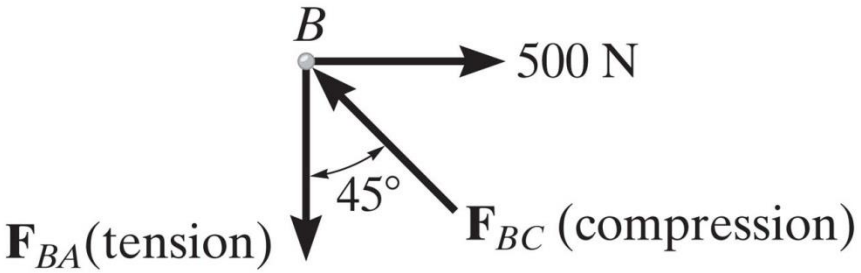
~~Unstable Element~~

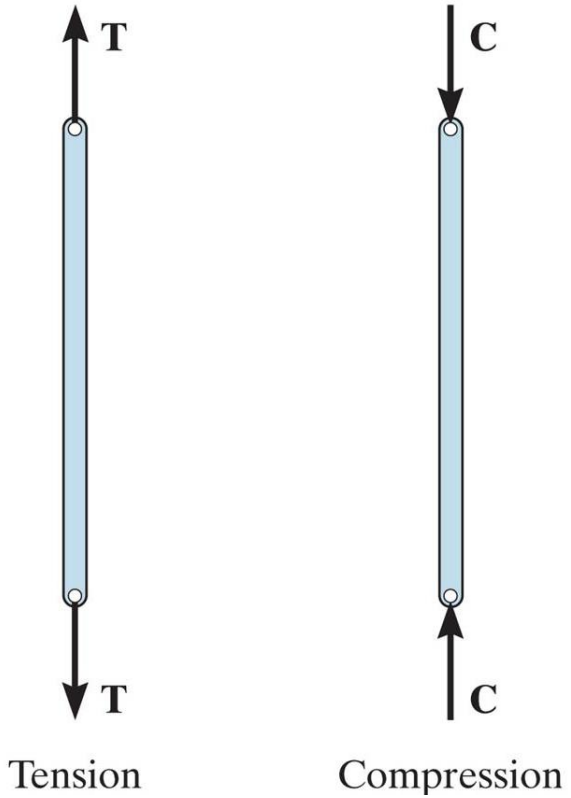
Stable Element

For trusses, we are interested in both external reactions, and ***internal member forces***.

Axial Tension (T) or *Axial Compression* (C)

Tension pulls and Compression pushes.

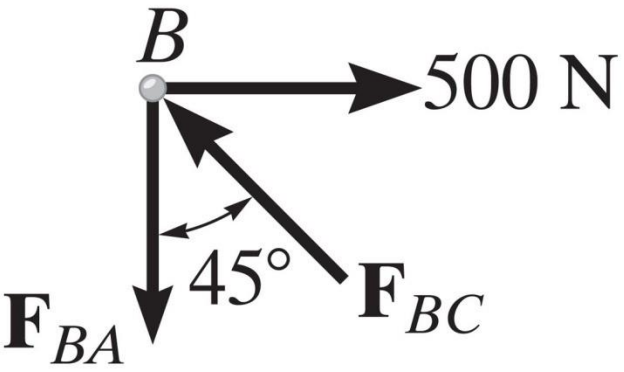


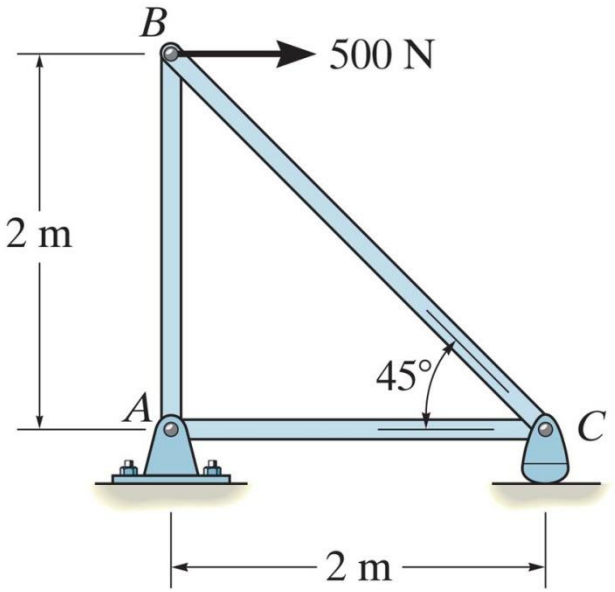


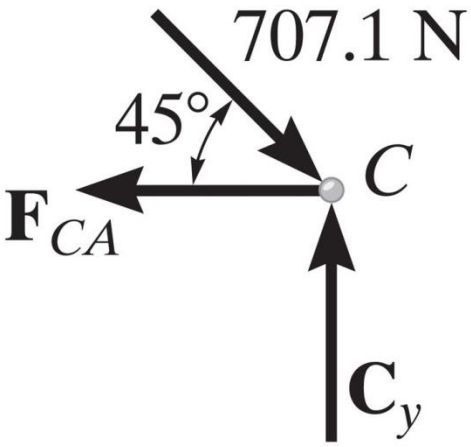
6.2: Method of Joints

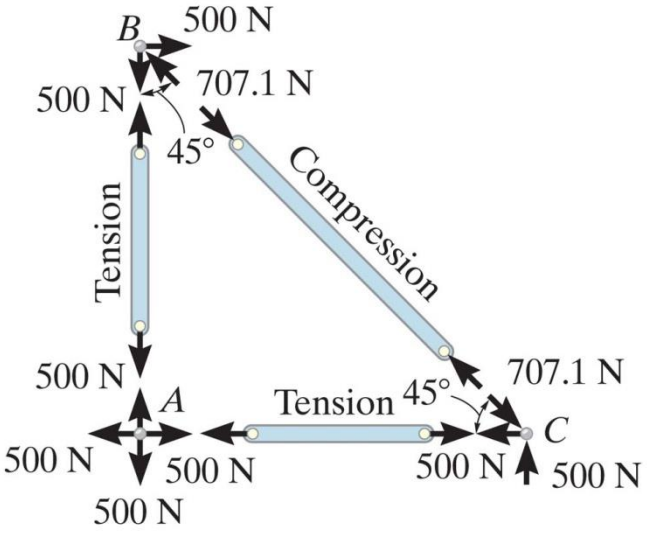
Sum forces at each joint in the truss

to solve for member forces:



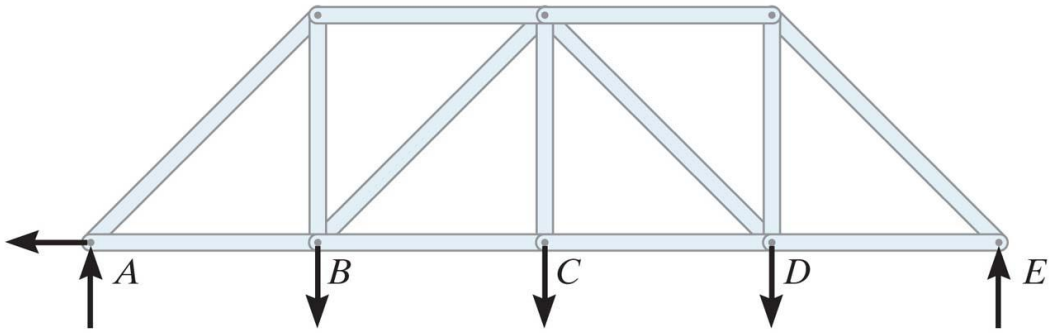






Procedure for analysis using Method of Joints:

1. Draw **FBD** of the entire truss.
2. Apply equilibrium eqns to solve for reactions.
3. Draw **FBD** of joint with no more than 2 unknown forces.
4. Apply equilibrium eqns to solve for unknown member forces, & determine in tens. or compression.
5. Go to another joint w/ no more than 2 unknown forces.
6. Repeat steps 4 & 5 until all members forces are found.
7. Identify the ***Zero-Force Members*** in the truss.



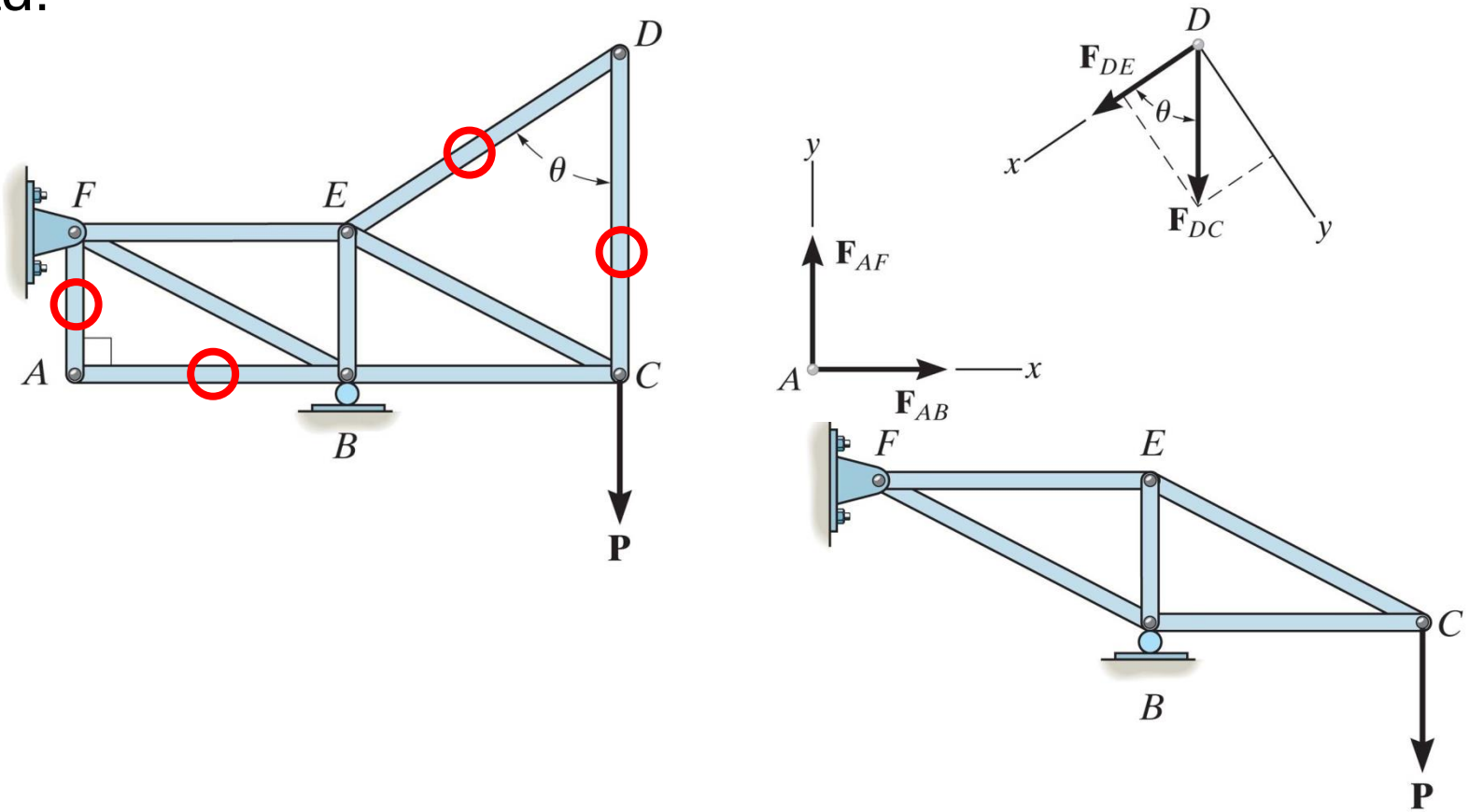
Bridge truss

6.3: Zero-Force Members

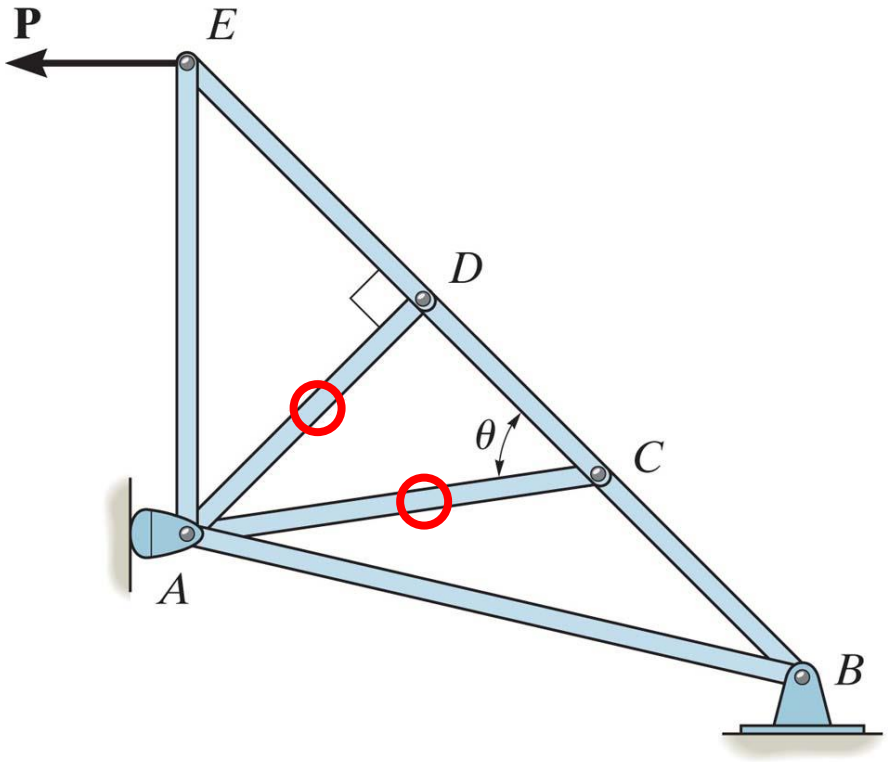
Zero-Force Members are truss members with no axial force.

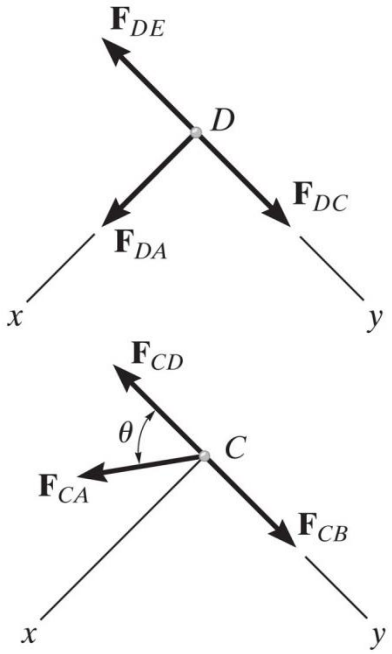
Two conditions exist for *Zero-force members*:

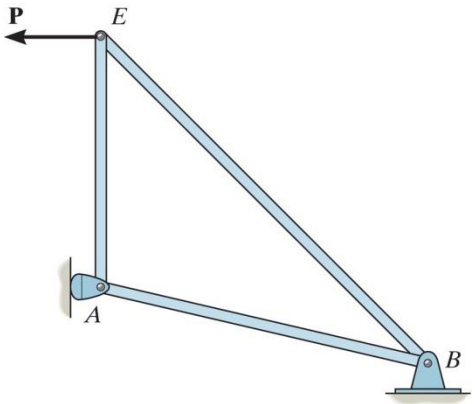
1. Two non-collinear members intersect at a joint with no load:



2. Two collinear members & a third non-collinear member intersect at a joint with no load:

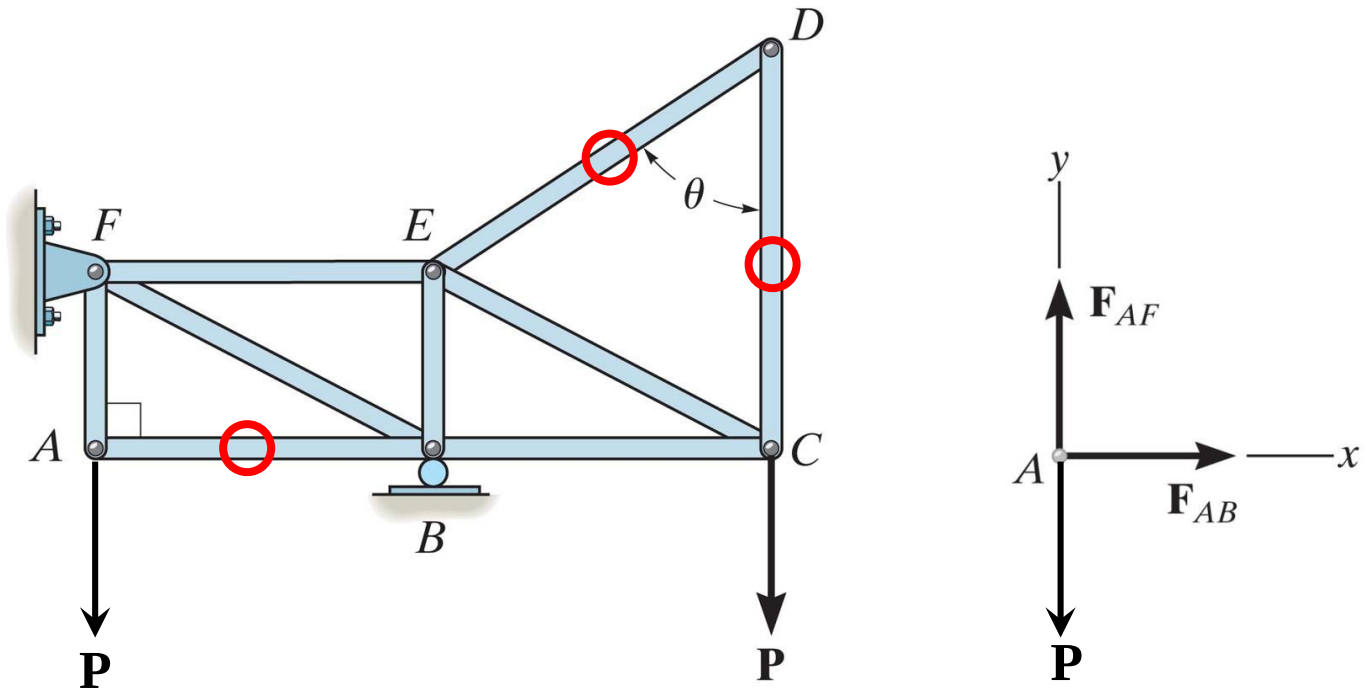




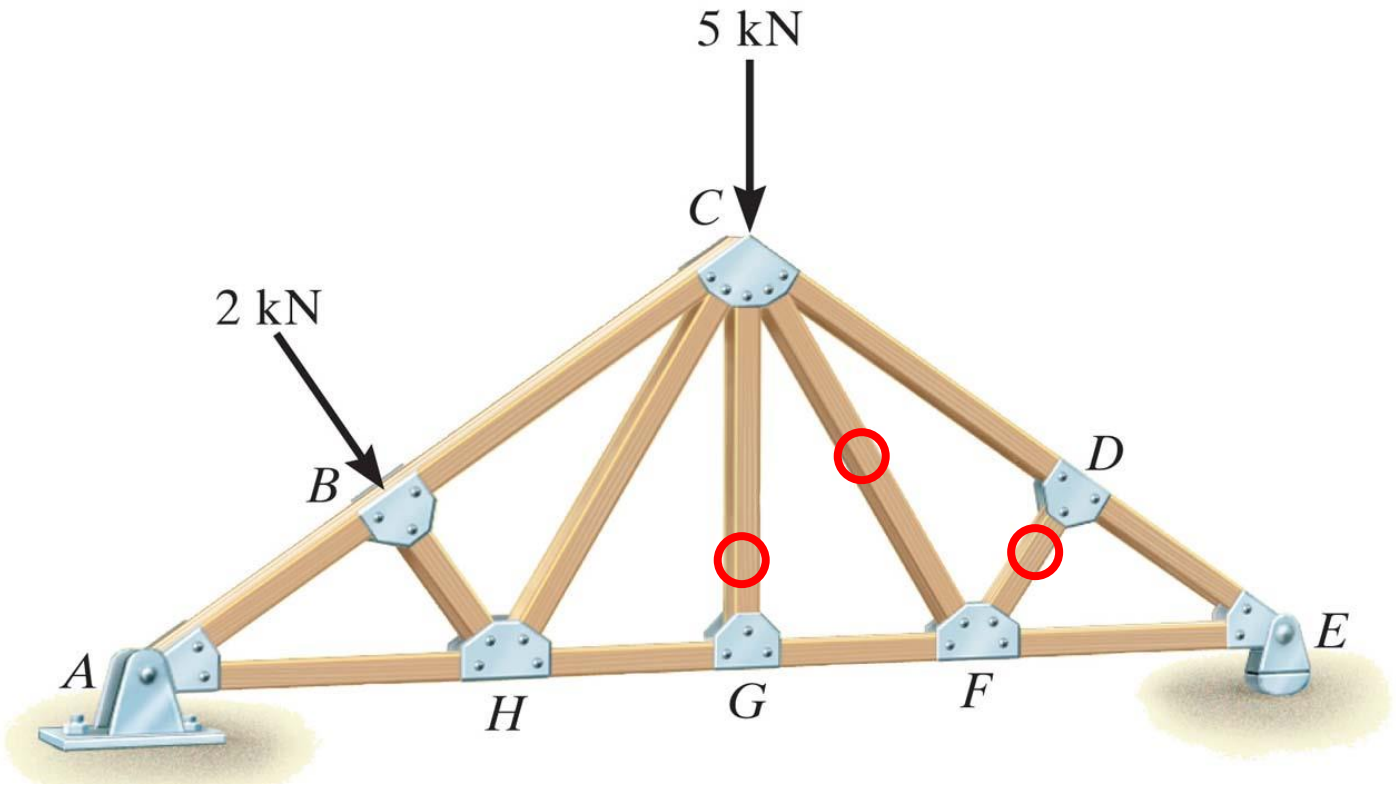


Of course there are exceptions to these two conditions:

1. Apply a force at joint A:



2. If a *zero-force member* is found, look at the joint at the other end of the to see if other zero-force members exist.



ENSC 2113
Engineering Mechanics: Statics

Lecture 20
Sections 6.1-6.3

College of Engineering, Architecture & Technology