ENSC 2113
Engineering Mechanics: Statics

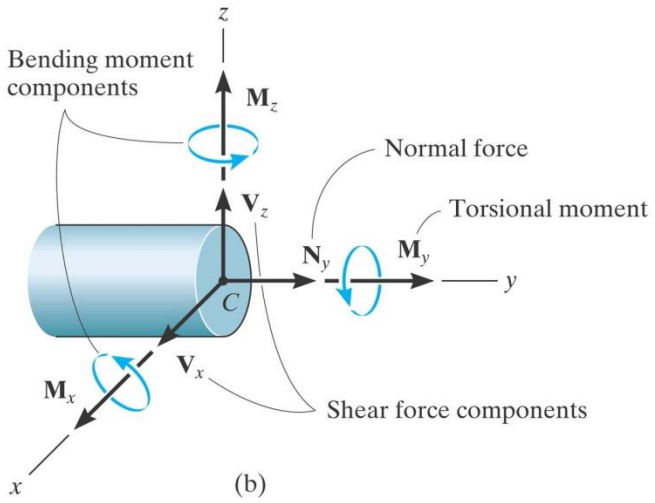
Lecture 24
Section 7.1

College of Engineering, Architecture & Technology

7.1: Internal Forces

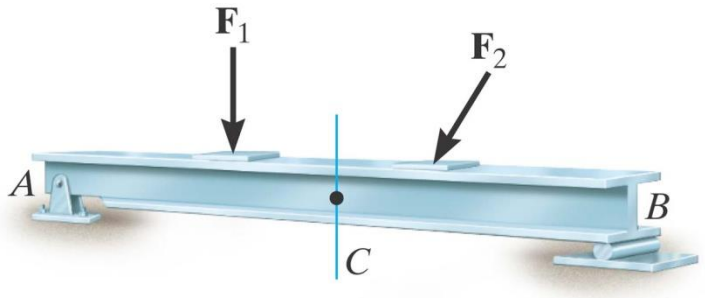
In 3 dimensions, 6 degrees of freedom = 6 internal forces:

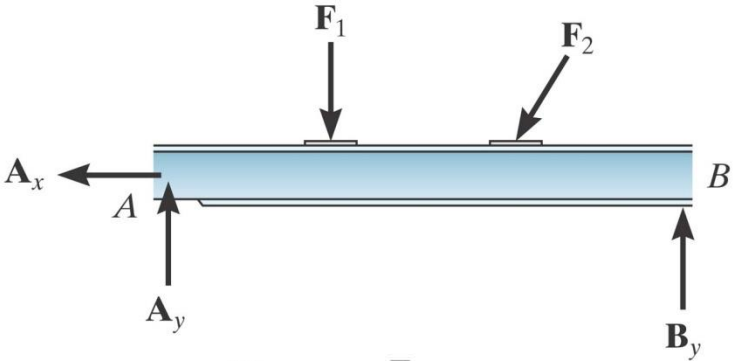
D.O.F.	Internal Force	Symbol
Δ_Y	Axial (Normal)	N
Δ_X	Shear	V_X
Δ_Z	Shear	V_Z
Θ_Y	Torsion	T
Θ_X	Moment	M_X
Θ_Z	Moment	M_Z

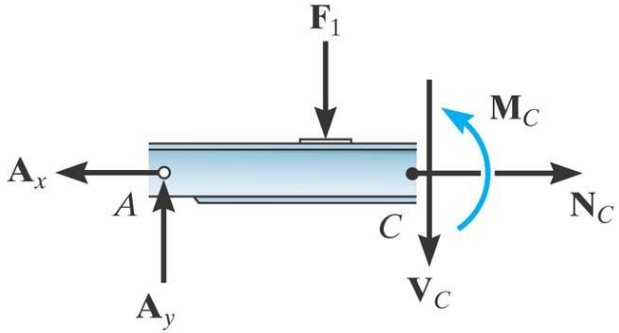


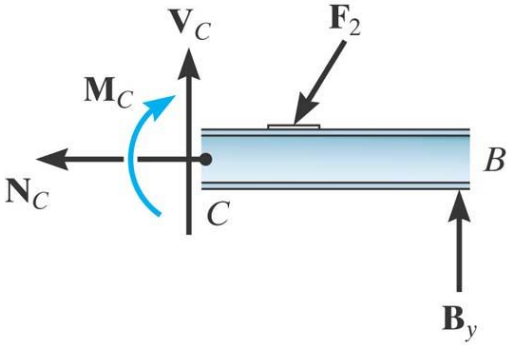
In 2 dimensions, 3 degrees of freedom = 3 internal forces:

D.O.F.	Internal Force	Symbol
Δ_X	Axial (Normal)	N
Δ_Y	Shear	V
Θ	Moment	M







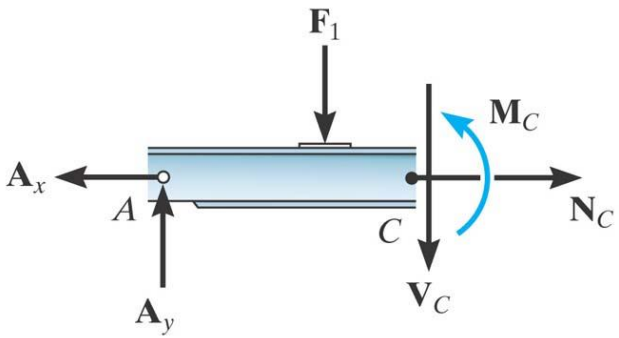


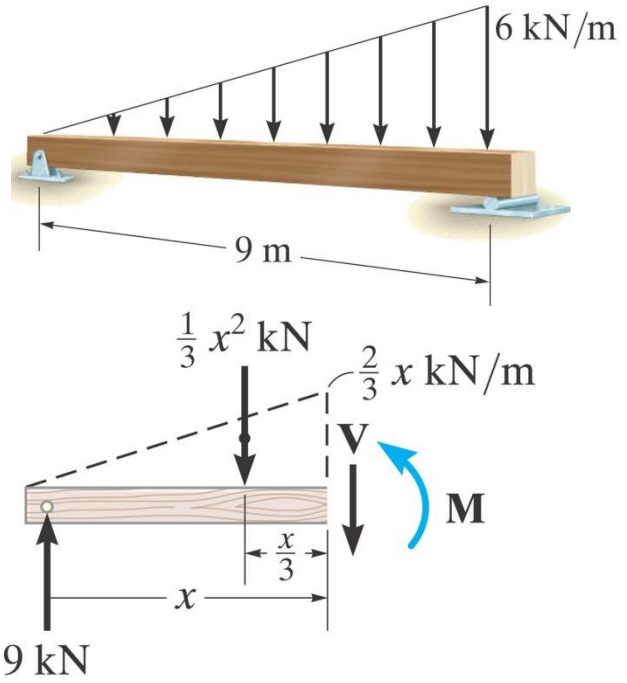
We can solve for internal forces in one of 3 ways:

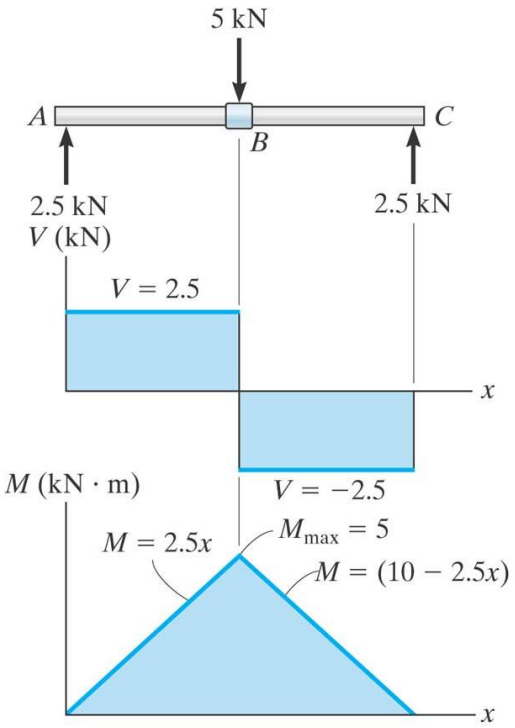
1) Cut a **FBD** at a specific location (*Section 7.1*).

2) Cut a **FBD** w/in a general region of a member & derive eqns for the internal forces in that region (*Section 7.2*).

3) Apply relationships between load, force & moment to graphically describe the forces & moments (*Section 7.3*).





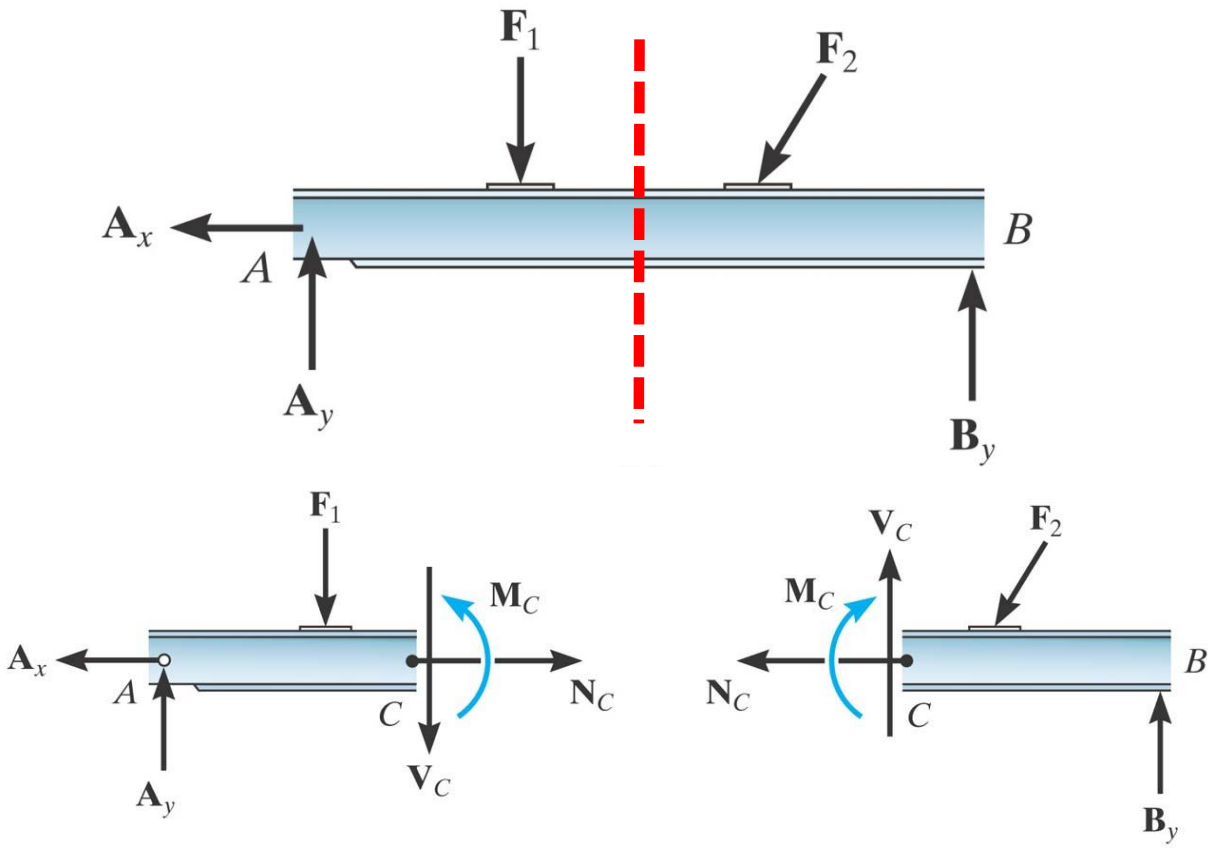


Procedure for determining internal forces at a location:

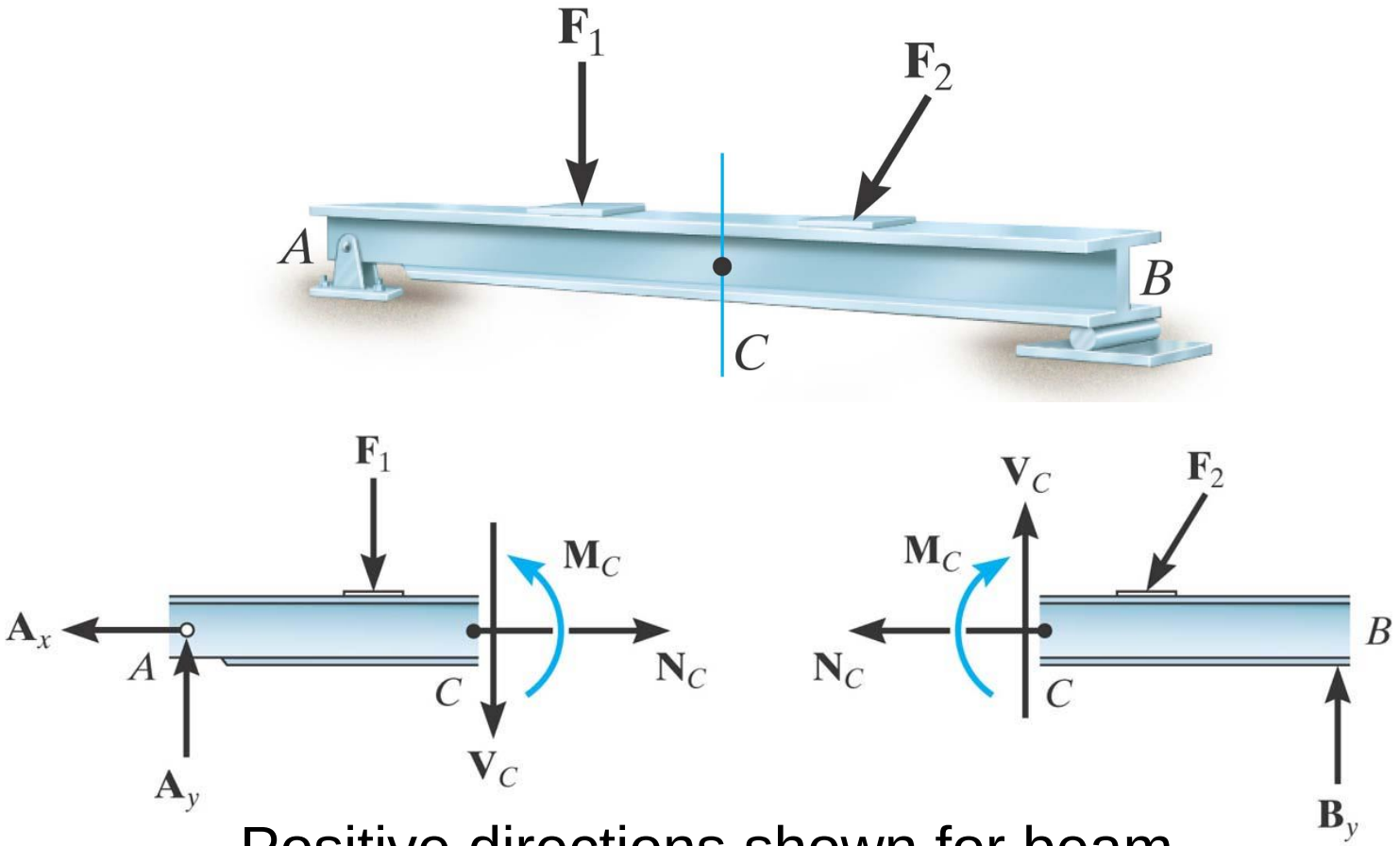
1) Draw **FBD** of entire structure & solve for support reactions I if they are needed.

2) Draw **FBD** at location where internal forces are to be found.

3) Apply equilibrium eqns to **FBD** & solve for up to 3 internal forces.



Positive direction for internal forces depends on which side of the section cut you use.



Positive directions shown for beam

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