CLASS 14 - INTRODUCTION TO BENDING

OBJECTIVES:
1. Define beams
2. Review shear & moment diagrams (CE211)

READ: CH7 (PHILDOT)

1. BEAMS - TERMINOLOGY

Long straight elements carrying load perpendicular to longitudinal axis

- "Simply supported"
- "Cantilevered"
- "Overhang"

2. INTERNAL REACTION FOR EQUILIBRIUM

Shear & moment holds beam in equilibrium

Will be in equilibrium

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(3) **SHALLOW & MOMENT SIGN CONVENTION**

**Positive Internal Shear**

![Diagram of positive internal shear](image)

**Positive Internal Moment**

![Diagram of positive internal moment](image)

**Note:** Arbitrary, be consistent!
A simple beam \( AB \) is subjected to a counterclockwise couple of moment \( M_0 \) acting at distance \( a \) from the left-hand support (see figure).

Draw the shear-force and bending-moment diagrams for this beam.
Draw the shear-force and bending-moment diagrams for a cantilever beam $AB$ carrying a uniform load of intensity $q$ over one-half of its length (see figure).
A simple beam $AB$ is subjected to a counterclockwise couple of moment $M_0$ acting at distance $a$ from the left-hand support (see figure).
Draw the shear-force and bending-moment diagrams for this beam.

Draw the shear-force and bending-moment diagrams for a cantilever beam $AB$ carrying a uniform load of intensity $q$ over one-half of its length (see figure).
The cantilever beam $AB$ shown in the figure is subjected to a concentrated load $P$ at the midpoint and a counterclockwise couple of moment $M_1 = PL/4$ at the free end.

Draw the shear-force and bending-moment diagrams for this beam.
The simple beam $AB$ shown in the figure is subjected to a concentrated load $P$ and a clockwise couple $M_1 = PL/4$ acting at the third points.

Draw the shear-force and bending-moment diagrams for this beam.
The cantilever beam $AB$ shown in the figure is subjected to a concentrated load $P$ at the midpoint and a counterclockwise couple of moment $M_A = PL/4$ at the free end. Draw the shear-force and bending-moment diagrams for this beam.

The simple beam $AB$ shown in the figure is subjected to a concentrated load $P$ and a clockwise couple $M_1 = PL/4$ acting at the third points. Draw the shear-force and bending-moment diagrams for this beam.
A simple beam $AB$ subjected to clockwise couples $M_1$ and $2M_1$ acting at the third points is shown in the figure.

Draw the shear-force and bending-moment diagrams for this beam.
A simply supported beam $ABC$ is loaded by a vertical load $P$ acting at the end of a bracket $BDE$ (see figure). Draw the shear-force and bending-moment diagrams for beam $ABC$. 
A simple beam $AB$ subjected to clockwise couples $M_1$ and $2M_1$ acting at the third points is shown in the figure. Draw the shear-force and bending-moment diagrams for this beam.

\[ R_A = \frac{3M_1}{L} \quad \frac{L}{3} \quad \frac{L}{3} \quad \frac{L}{3} \quad \frac{3M_1}{L} \quad R_B = \frac{3M_1}{L} \]

A simply supported beam $ABC$ is loaded by a vertical load $P$ acting at the end of a bracket $BDE$ (see figure). Draw the shear-force and bending-moment diagrams for beam $ABC$. 

\[ R_A = \frac{P}{2} \quad \frac{L}{4} \quad \frac{3L}{4} \quad \frac{P}{2} \quad R_C = \frac{P}{2} \]

\[ V = \frac{P}{2} \quad -\frac{P}{2} \quad \frac{PL}{8} \quad \frac{3PL}{8} \]

\[ M = \frac{PL}{8} \quad \frac{3PL}{8} \]