Glasgow Caledonian University

School of Engineering & Built Environment

MEng/BEng(Hons) in:

Mechanical-Electronic Systems Engineering
Mechanical & Power Plant Systems
Computer-Aided Mechanical Engineering
Electrical Power Engineering

Module: Engineering Design & Analysis 2
(Module No. M2H721926)

Deflection of Beams
Standard Beams: A Summary

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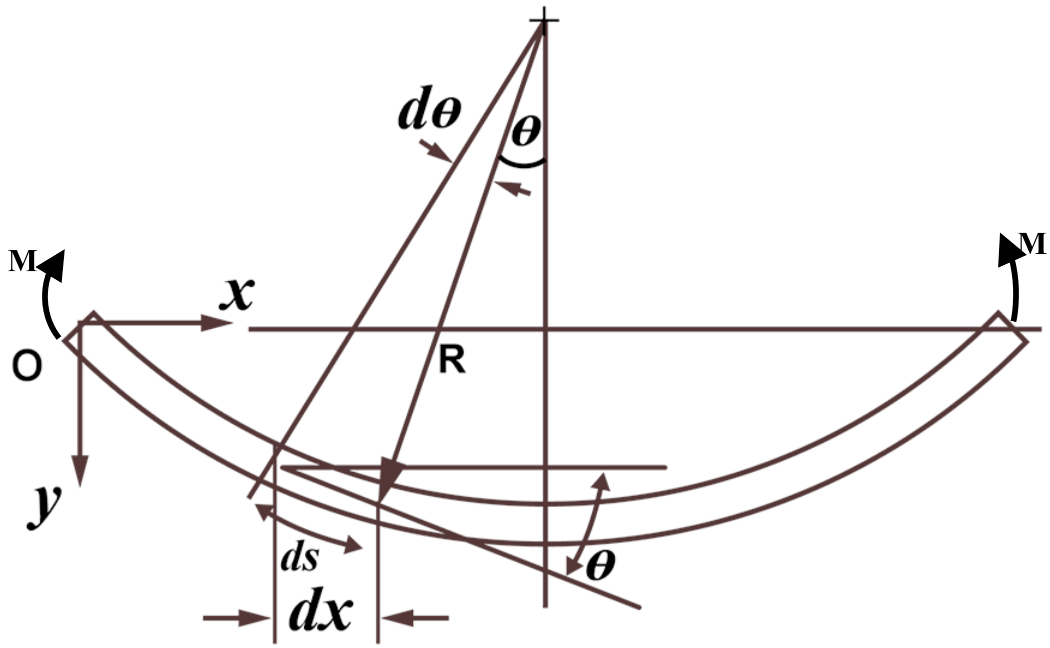
Deflection of Beams

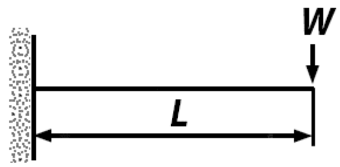
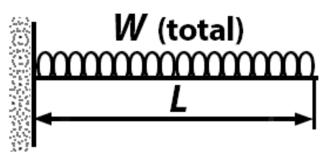
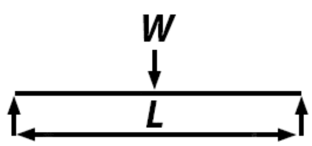
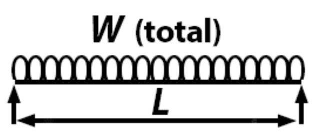


Differential equation of flexure: $EI\frac{d^2y}{dx^2} = -M$

This equation is known as the, where EI is known as the *flexural stiffness* or *flexural rigidity* of the beam. The equation allows for the determination of beam deflection at any point along the length of a beam, and importantly, the maximum value and where it occurs.

Deflection of Beams – Standard Cases

The table shows the equations derived for maximum slope and maximum deflection for standard beams and cantilevers. In each case, L is the total length and W is the total load. For the distributed load cases, W = wL, where w = load per unit length.

Case	Loading Diagram	Maximum slope	Maximum deflection
1. Cantilever end point load		$\frac{WL^2}{2EI}$	$\frac{WL^3}{3EI}$
2. Cantilever, uniformly distributed load		$\frac{WL^2}{6EI}$	$\frac{WL^3}{8EI}$
3. Simply supported beam, central point load		$\frac{WL^2}{16EI}$	$\frac{WL^3}{48EI}$
4. Simply supported beam, uniformly distributed load		$\frac{WL^2}{24EI}$	$\frac{5WL^3}{384EI}$