

**Relevant Course:** Analysis by Slope-deflection Method

**Relevant Department:** Civil Engineering

**Relevant Semester:** 6

**Pre-requisite :** The students are expected to have already learned to analyse statically determinate structures, as well as statically indeterminate structures by force methods (such as method of consistent deformation).

1. Review of basic concepts (kinematic indeterminacy , flexural stiffness, fixed end moments); derivations of slope deflection equations
2. Demonstration of the method as applied to beams and frames, with and without known support settlements/rotations
3. Simplified analysis (with reduced kinematic indeterminacy ) for various problems: hinged end support guided fixed end support, symmetric structures)
4. Application to problems with unknown sway degrees of freedom

The topic is introduced by first giving an overview of 'displacement methods' of structural analysis (as different from 'force methods'), followed by discussing the basic concepts of kinematic indeterminacy, stiffness, fixed end moments and moment equilibrium at joints, with examples related to beams and plane frames.

The basic slope-deflection equations are then derived, and the slope-deflection method is applied to simple beam and frame problems (with one or multiple unknown joint rotations), with and without support settlements / rotations. Next, it is shown how the analysis can be simplified, taking advantage of reduced kinematic indeterminacy, when the extreme ends of the members have hinged or guided fixed supports.

Finally, problems with unknown sway degrees of freedom are taken up and their solutions demonstrated, invoking the concept of force equilibrium. In the concluding session, it will be also shown how this method led to the moment distribution method (for convenient manual analysis) and stiffness method of analysis (for computer-aided analysis) of structures