

Student Guide:

Influence lines are extremely valuable tools for determining where to place loads on structures such that the loads cause the maximum possible destructive effect. Using an influence line assures the engineer that there is no combination or positioning of loads which could cause a greater action (reaction, axial force, shear, or moment) at the selected point in the structure. They further permit you to calculate the magnitude of these maximum actions at that point in the structure, for use in design.

Influence lines are constructed for a single action, at a single point in the structure. For example, an influence line might be constructed for the left reaction of a simply supported beam. Or, an influence line could be constructed for the moment at the quarter point in the beam. Note that in both cases you select a single point on the structure as well as a single action such as moment or shear before the influence line is drawn.

Influence lines are used in the following manner. Please note that this is merely an overview. Detailed explanations of each step will follow.

- 1) A point in the structure is selected for design. For example, perhaps you are ready to design the left support reaction of a simply supported beam, or to design the quarter-point of a simply supported overhanging beam to resist moment.
- 2) An influence line is generated for that action (left support reaction, or moment at quarter-point) using either statics, or the Mueller-Breslau Principle.
- 3) Observing the magnitudes of the resulting influence line, the given design loads are placed in critical positions.
- 4) The influence line is then used to compute the maximum possible action and the structural design is performed.

The following will be expected of you to successfully complete this module:

- 1) Attend class and listen to the lectures on influence lines
- 2) Review the accompanying reading materials on influence lines in this module
- 3) Practice with the material using the interactive influence line modules until you can correctly answer the questions.
- 4) Practice with the interactive examinations on influence line modules.

You will know you are competent in this material when you can correctly answer the computer-generated questions a majority of the time. You can probably expect the same grade on your professor's examinations as you make there.

An average student in Civil Engineering should expect to spend the following amount of time studying this subject to become competent:

Submodule 1: Introduction to influence lines

Lecture time – 10 minutes

Out of class reading time – 10 minutes

Computer generated homework – 0 minutes

Submodule 2: Generation of influence lines using statics

Lecture time – 30 minutes

Out of class reading time – 30 minutes

Computer generated homework – 60 minutes

Submodule 3: Generation of influence lines using the Muller-Breslau principle

Lecture time – 40 minutes

Out of class reading time – 30 minutes

Computer generated homework – 60 minutes

Submodule 4: Placement of loads using influence lines

Lecture time – 30 minutes

Out of class reading time – 30 minutes

Computer generated homework – 60 minutes

Submodule 5: Calculation of reactions, shears, and moments using influence lines

Lecture time – 40 minutes

Out of class reading time – 30 minutes

Computer generated homework – 60 minutes