

Course Code	Course Title	L	T	P	C
17CE024	SOIL STRUCTURE INTERACTION	3	0	0	3

Course Objectives:

1. To understand various principles governing soil-structure interaction effect.
2. To familiarise the students with design and analysis of sub-structures incorporating with the effect of soil-structure interaction.

Course outcomes:

The student will be able to

1. Understand scope of soil-foundation interaction effect
2. Gain knowledge about modelling of elastic foundation
3. Predict settlement and deflections of laterally loaded piles

Activities:

1. Model two different substructure in STAAD Pro with and without soil structure. Analyse the models to quantify soil structure interaction effect
2. Design a pile subjected to lateral load and find settlements and deflections
3. Make a mathematical and computer model to understand pile group interaction effect

Skills:

1. Determination of deflection of a laterally loaded pile
2. Differentiate the computer models of substructure with and without soil-structure interaction effect consideration

UNIT I: Soil-Foundation Interaction

Introduction to soil - Foundation interaction problems, Soil behaviour, Foundation behaviour, Interface, behaviour, Scope of soil-foundation interaction analysis, soil response models,

Winkler, Elastic continuum, Two parameter elastic models, Elastic plastic behaviour, Time dependent behaviour.

UNIT II: Beam on Elastic Foundation - Soil Models:

Infinite beam, Two parameters, Isotropic elastic half space, Analysis of beams of finite length, Classification of finite beams in relation to their stiffness.

UNIT III: Plate on Elastic Medium:

Infinite plate, Winkler, Two parameters, Isotropic elastic medium, Thin and thick plates, Analysis of finite plates, rectangular and circular plates, Numerical analysis of finite plates, simple solutions.

UNIT IV: Elastic Analysis of Pile:

Elastic analysis of single pile, Theoretical solutions for settlement and load distribution, Analysis of pile group, Interaction analysis, Load distribution in groups with rigid cap.

UNIT V: Laterally Loaded Pile:

Load deflection prediction for laterally loaded piles, subgrade reaction and elastic analysis, Interaction analysis, and pile raft system, solutions through influence charts.

TEXTBOOKS:

1. Hemsley, J.A, “Elastic Analysis of Raft Foundations”, Thomas Telford, 1998.
2. McCarthy, D.F. “Essentials of Soil Mechanics and Foundations”, (6th Edition), Prentice Hall, 2002.
3. Selvadurai, A.P.S., “Elastic Analysis of Soil Foundation Interaction”, Elsevier, 1979.

REFERENCES:

1. Poulos, H.G., and Davis, E.H., “Pile Foundation Analysis and Design”, John Wiley, 1980.
2. Scott, R.F. “Foundation Analysis”, Prentice Hall, 1981.
3. “Structure Soil Interaction - State of Art Report”, Institution of structural Engineers, 1978.
4. ACI 336, “Suggested Analysis and Design Procedures for Combined Footings and Mats”, American Concrete Institute, Delhi, 1988.