3. Relevant Indian Standard Codes: IS-875, IS-1893, IS -4326, IS-13920.

ADVANCED FOUNDATION ENGINEERING

Course Code : 13CE 2211 **L P C**
4 0 3

Course Outcomes:

At the end of the course, the student will be able to:

CO1 : Identify a suitable foundation system for a structure.
CO2 : Evaluate the importance of raft foundation and principles of design for buildings and tower structures.
CO3 : Analyse and design pile foundations.
CO4 : Examine and discuss various machine foundations.
CO5 : Analyse and design Sheet piles and cofferdams.

UNIT – I

Foundation design basics : Criteria for choice of foundation, bearing capacity, total and differential settlement tolerance for various types of structures, Interpretation of soil profile from design parameters like modulus of compressibility, Modulus of subgrade reaction, Poisson's ratio, etc.

UNIT – II

Raft foundations : Raft foundations for building and tower structures, including effects of soil-structure interaction and nonlinearity, different types of rafts

UNIT – III

Deep foundations : Pile foundation-types, methods of installation, codal practices for permissible load under vertical and lateral loads, stresses during pile driving, load carrying capacity of pile groups, negative skin friction, under-reamed piles

Foundation for heavy structures, well foundations, caisson foundations, equipment used for construction of these foundation systems.

UNIT – IV

Machine foundations : Theory of vibrations, free and forced vibrations with and without damping for a single degree freedom system, types of machine foundations, their design criteria, permissible amplitudes and bearing pressure.

UNIT – V

Cantilever sheet piles and anchored bulkheads: Earth pressure diagram, determination of depth of embedment in sands and clays, timbering of trenches, Earth pressure diagrams, forces in struts.

Cofferdams: Stability, bearing capacity, settlements (qualitative treatment only, no designs).

TEXT BOOKS

1. Das, B.M., *"Principles of Foundation Engineering"*, 4th Edition, PWS Publishing, Singapore, 1999

2. Bowles, J.E., *"Foundation Analysis and Design"*, 5th Edition, McGraw- Hill International, 2000

3. Shamsher Prakash, *"Soil Dynamics",* 3rd Edition, John Wiley publications, 2000

REFERENCES

1) Murthy, V.N.S., *"Soil Mechanics and Foundation Engineering"*, 4th Edition ,Sai Krupa Technical Consultants, 2000

2) Venkataramah, C., *"Geotechnical Engineering"*, 5th Edition, NewAge International Pvt.Ltd, Publishers, 2009

3) Swami Saran,*"Analysis and Design of Substructures"*, 2nd Edition, Oxford & IBH Publishing Company Pvt.Ltd 2009.

4) Gopal Ranjan & ASR Rao, *"Basic and Applied Soil Mechanics"*, 3rd Edition, New Age International Pvt.Ltd, Publishers, 2002.

5) Srinivasulu, P and Vaidyanathan, G.V., *"Handbook of Machine Foundations",* 2nd Edition, Tata McGraw Hill, 1999.

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FINITE ELEMENT METHOD WITH STRUCTURAL APPLICATIONS

Course Code: 13CE 2212

L	P	C
4	0	3

Course Outcomes:

At the end of the course, the student will be able to:

CO1 : Discuss the basics of FEM
CO2 : Explain the shape functions and stiffness matrix
CO3 : Prepare stiffness matrix for 2D elements
CO4 : Describe the use and concepts of iso-parametric elements.
CO5 : Analyse beams, 2D & 3D structural systems.

UNIT- I

Introduction : Concept of Finite Element Method - Merits and demerits, applications, relevant software's. Steps involved in FEM as applicable to structural mechanics problems. Descritization interpolation model, Convergence and compatibility criteria.

UNIT-II

Shape Functions - Methods of Determination

Element Stiffness matrix Equation - Derivation of stiffness matrix based on Principle of minimization of Total Potential Energy and Principle of Virtual Work.

Assemblage of Element Stiffness Matrices – Assembly procedure, solution of nodal displacement, Element Stresses and Strains, Interpretation of results, Post processing, Static condensation.

UNIT- III