Course syllabus

Department of Civil Engineering, Indian Institute of Technology Madras

CE5320 - Soil Dynamics

Credit Distribution: C:10 L:3 T:1 P:0 E:0 O:6 TH:0

Course Type: Theory

Description: To study the behaviour of soil and foundation systems subjected to dynamic loads.

Course Content: Fundamentals of vibration - Response of SDOF systems: Free vibration, Experimental determination of natural frequency and damping, Response of system to exciting forces and ground motions ranging from simple pulse like excitation to harmonic and complex histories, Transmissibility, Vibration measuring instruments, Response of 2 DOF and Introduction to Multi degree of freedom systems. Propagation of seismic waves in soil deposits - Attenuation of stress waves, Stress-strain behaviour of cyclically loaded soils, Strength of cyclically loaded soils, Dynamic soil properties - Laboratory and field testing techniques, Selection of design values. Dynamic stiffness of foundation "Circular rigid mat foundation on elastic half space excited vertically, laterally, torsion or rocking, Effective stiffness and damping of such systems, Modelling of soil medium by frequency dependent and frequency independent elements, Effect of soil material damping and shape, Effect of foundation embedment, Finite soil layer and depth to bedrock on system of rigid foundations, Dynamic stiffness of single pile and pile group, Introduction to Seismic SSI analysis. Analysis and design of block foundations for reciprocating engines, Low speed rotary machines, Forge hammers and frame foundations for high speed rotary machineries, Vibration isolation and absorption techniques; Computer codes.

Text Books

- Das B.M and Ramana G.V. (2011). Principles of Soil Dynamics, 2nd Edition, Cengage Learning, Stamford, USA.
- Kramer, S. L. (1996). Geotechnical Earthquake Engineering, Pearson Education Inc., New Delhi. Prakash, S. and Puri, V. K. (1998). Foundation for Machines: Analysis and Design, John Wiley & Sons, New York.
- Prakash S.(1981), Soil Dynamics, MCGraw Hill, New York,
- Richart, F.E. Jr., Hall, J.R. Jr. and Woods, R. D. (1970). Vibrations of Soils and Foundations, Prentice-Hall Inc., New Jersey

Reference Books

- Arya S.D, O Neil M. and Pincus G(1979), â€oeDesign of structures and foundations for vibrating machines, Gulfpublishing co., Houston, USA
- Chowdury I. and Dasgupta S.P. (2009), Dynamics of Structure and Foundation, unified Approach, Vol. 1: Fundamentals, Vol.2-Applications, CRC Press.
- El. Nagger (2000). Dynamics of Foundations. Kerry Rowe (Ed.) in Geotechnical and Geoenvironmental Engineering Handbook, Kluwer Academic Publishers, USA.
- Gazetas, G (1991). Foundations Vibrations. Fang, H.Y (Ed.) In Foundation Engineering Handbook, 2nd Edn, Van Nostrand Reinhold, New York.
- Kameswara Rao N.S.V.(1998), Vibration analysis and foundation dynamics, Wheeler Publication ltd., Villaverde R. (2009), Fundamental concepts of Earthquake Engineering,

- CRC Press. Rao, S. S. (2004). Mechanical Vibrations, 4th Ed., Pearson Education Inc., New Delhi.

Prerequisite: NIL