



# EARTHQUAKE RESISTANT DESIGN OF FOUNDATIONS

**PROF. B. K. MAHESHWARI**

Department of Civil Engineering  
IIT Roorke

**TYPE OF COURSE** : New | Both | UG | PG

**COURSE DURATION** : 8 weeks (17 Aug' 20 - 9 Oct' 20)

**EXAM DATE** : 17 Oct 2020

**PRE-REQUISITES** : Soil Mechanics and Foundation Engineering

**INTENDED AUDIENCE** : BE/ B Tech (Civil Engineering) as an elective in the final year. ME/MTech either in Geotechnical Eng. or in Structural Engineering

**INDUSTRIES APPLICABLE TO** : NPCIL, BHEL, THDC, NTPC, NHPC, ONGC, RDSO, RVNL, CPWD, NBCC, L&T, KELLER, Fugro, Maccaferri, GENSTRU, STRATA etc. (probably)

## **COURSE OUTLINE :**

The course covers various types of foundations, required soil investigations, soil parameters, and codes of practice. Design considerations for seismic resistant design of foundations. The course will focus on techniques of design of foundations so that it does not fail during earthquakes. This will cover both shallow and deep foundations. Major focus will be on the design of deep foundations for lateral loads.

## **ABOUT INSTRUCTOR :**

Prof. (Dr.) B. K. Maheshwari is currently a Professor at Department of Earthquake Engineering, IIT Roorkee. He secured Bachelors Degree in Civil Engineering from University of Jodhpur, Masters Degree in Earthquake Engineering from Univ. of Roorkee.

## **COURSE PLAN :**

- Week 1:** Introduction: General requirements, types of shallow and deep foundations and their use; performance of various types of foundations during past earthquakes.
- Week 2:** Shallow Foundations: IS codes for bearing capacity and settlement of foundations. foundation design, modes of soil failure, safe bearing capacity, differential & total settlements, increase in permissible stress under earthquake loads
- Week 3:** Shallow Foundations:; methods of analysis, experimental investigations, Combined footings for earthquake loads
- Week 4:** Shallow Foundations: Raft foundation, modulus of sub grade reaction, Winkler model, beam on elastic foundation, soil line method.
- Week 5:** Bearing Capacity under Transient & Earthquake Type Loads: Types of dynamic loads; Footing requirements to account for settlements and earthquake induced forces; Pseudo-Static analysis of footings with eccentric & inclined loads. Effect of horizontal load and moment
- Week 6:** Dynamic Bearing Capacity and Design Data: Dynamic Analysis of shallow foundations for various modes of vibrations, Design seismic coefficients for various foundation soil systems, provisions of IS codes and their limitations; seismic coefficient and response spectra methods.
- Week 7:** Pile Foundations: Types of piles based on usage, material, construction etc. pile load capacity in compression, Bearing capacity of piles, group action of piles, settlement of a pile group
- Week 8:** Pile Foundations: Laterally loaded piles, elastic analysis; Reese and Matlock approach, fixity of pile heads, dimensionless factors; Pile with dynamic loads.