



**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI**  
Pilani Campus

BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, PILANI  
INSTRUCTION DIVISION  
FIRST SEMESTER 2016-2017  
Course Handout (Part II)

Date: 03/08/2016

In addition to part I (General Handout for the course appends to the time table) this portion gives further specific details regarding course.

Course No. : **CE G632**  
Course Title : **Design of Foundations for Dynamic Loads**  
Instructor-in-charge : RAVI KANT MITTAL

**1. Scope & Objective of the Course:**

The main goal of this course is to provide an in-depth understanding regarding analysis and design of foundations systems for buildings, bridges substructure, industrial complexes, ports, harbors, and water tanks, storage tanks of industrial structure, transmission line towers, and machines subjected to static and dynamic loads. Complete design of foundation systems considering geotechnical as well structural (R.C.C.) design of foundation systems (spread footing, combined footing, raft foundation, ring foundation, pile foundations, pile cap, machine foundations, basements walls, retaining structures etc.). Emphasis will be given on complete coverage of Indian code of practice for various type of foundation. Latest advancement and practices followed in design office as per International code and standards will be covered.

**Text Book:**

- T1. Das B M and Luo Z. (2016) Principles of Soil Dynamics, Cengage Learning, 3<sup>rd</sup> edition.  
T2. Saran, S. (2016), "Soil Dynamics and Machine foundation" Galgotia Publisher, 3<sup>rd</sup> edition.

**3. Reference Books:**

- R1. Saran, S. (2012), "Analysis and design of foundations and retaining structures subjected to seismic loads" I K Lee Publishers.  
R2. Bhatia K G (2009) "Foundations for industrial machines" CRC Press, Taylor and Francis.  
R3. Saran, S. (2006) "Analysis and design of sub-structures" 2<sup>nd</sup> ed., Oxford & IBH Publishing . New Delhi  
R4. Relevant BIS codes and International code of practice

**4. Course Plan**

Learning Objective	Topics to be covered	No of Lec.	Ref. to Ch.
Evaluation and interpretation of soil properties	Static and Dynamic properties of soil, using laboratory and field tests. Evaluation and interpretation of geotechnical reports, selecting foundation design parameters from laboratory and field tests	3	4, T1, 2R1, 1, 2,3 R2,
Foundations design – general requirement under static and dynamic loads	General principles, concepts, requirement for satisfactory performance of foundations, Types of foundations and their specific applications	3	IS 1904, IBC-2015
Bearing capacity and settlement of shallow foundations	Failure mechanism, generalized bearing capacity eqn, bearing capacity from field tests, consolidation, settlement calculations using field tests	3	IS6403, IS8009, 6,7,R3
Analysis of Shallow Foundations subjected to lateral loads and moments due to wind, earthquake.	Effect of load eccentricity and inclination due to wind, earthquake , pressure distribution, bearing capacity, tilt and settlement, Proportioning of footings subjected to combined vertical, moment and horizontal loads, optimization.	4	7R3, NOTES
Seismic Bearing capacity, Settlement and displacement of shallow foundations during earthquake.	Seismic bearing capacity, settlement and displacement of shallow foundation during earthquake, effect of liquefaction.	3	6 T1, 4R1, Class notes
IS 456-2000 provisions on RCC foundation design	Load combination, critical sections for shear and B.M., development length, detailing requirements, additional requirement during earthquake	2	5-7R3, IS456, ACI 318-2014



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Design of shallow foundations	structural design of isolated footings, strip, rectangular and trapezoidal combined footings – strap – balanced footings	3	4,5,6,7,R3
Design of raft foundations	Design of raft foundation using conventional rigid method, Coefficient of subgrade reaction, Winkler model for footings and mat on elastic foundations	2	IS2950, 10,11, R3
Design Circular and annular rafts subjected to dynamic loads	Analysis for wind and EQ loads, Optimum dimension, moments and shears in annular rafts using BIS Code and Chu & Afandi method	2	7R3
Pile Foundations	Types of Piles and their applications - Load capacity - Settlements - Group action	2	8, R4, IS2911
Laterally loaded Pile Foundations and seismic analysis	Different methods for estimating Lateral load capacity of piles, Computing static and dynamic stiffness of piles and pile group, dynamic analysis, seismic design consideration	4	7,T1, 7,R1,notes
Design of pile foundation	Design of piles, pile cap, under-ream piles, detailing.	2	16, 17T1, 13T2, R4
Machine Foundations- Design parameters	Types - General requirements and design criteria - General analysis of machine-foundations-soil system - Stiffness and damping parameters - Tests for design parameters -	1	1,5,6,7T2
Analysis and design of foundations for different type of machines.	Analysis and design of block and frame foundations for reciprocating engines, impact type machines, rotary type machines, turbo generator	4	8,9,10,11T2
Dynamic earth pressures theories, Design and construction of retaining walls and bridge abutment.	Various theories for computation of dynamic earth pressures, Basis of retaining wall design, stability condition, Seismic design consideration. Codal provisions.	4	8,T1,3,7,8,9,R1, 19 T2, IRC6-2014, IS1893-part3-2014
Ground improvement techniques	Anti-liquefaction measures, In-situ densification, preloading, PVD, stone columns, geosynthetics, grouting and reinforcing techniques using waste and natural material. Successful case histories in structural design and construction.	2	IS codes and notes
	Total	45	

**5. Evaluation Scheme:**

Component	Duration	Weightage	Date & Time	Venue	Remarks
Mid Term Test	90 min	25%	4/10, 4:00-5:30 PM		CB
Assignment	----	10%	Continuous		OB
Literature review and Project	----	20%	Continuous	-	OB
Term paper	----	10%	Continuous		OB
Comprehensive	3 hrs	35%	5/12, AN		CB/OB

**6. Chamber Consultation Hour:** Wednesday, 4 PM

7. Reading assignments will be given whenever necessary.

7. **Notice:** Notices will be displayed on Civil Engg. Department Notice Board only.

Instructor-in-charge



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