



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: 02/08/2016

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 F313**
Course Title : **Foundations Engineering**
Instructor In-charge : **RAVI KANT MITTAL**
Instructor : Kamlesh Kumar, Gaurav Gill

1. Scope & Objective of the Course:

The main goal of this course is to provide an in-depth understanding regarding different types of foundations. Complete analysis of foundations and retaining structures (spread footing, combined footing, raft foundation, ring foundation, pile foundations, machine foundations, retaining walls, slope stability etc.) considering all geotechnical aspects is included. Emphasis will be given on complete coverage of code of practices for various types of foundations and retaining structures. Ground improvement techniques, reinforced earth walls, geosynthetics applications increased tremendously therefore given due consideration.

Text Book:

TB. Murthy, V. N. S. “Geotechnical Engineering: Principles and Practices of Soil Mechanics and Foundation Engineering”, CRC Press, Taylor & Francis Group, First Indian Reprint, 2010.

3. Reference Books:

- R1. Das B M (2011) Principles of Foundation engineering, Cengage Learning, 7th edition.
R2. Kaniraj, S.R. “Design Aids in Soil Mechanics and Foundation Engineering”, Tata McGraw Hill, 1988.
R3. Gulhati, SK, and Datta, M. “Geotechnical Engineering”, Tata McGraw-Hill Publishing Company Ltd, 2005.
R4. Koerner, R. M. “Designing With Geosynthetics”, Xlibris, Corp., 6 edition, 2012.
R5. Saran, S. “Analysis and design of foundations and retaining structures subjected to seismic loads” I K Lee Publishers, 2012
R6. Relevant BIS, IRC codes and International code of practice

4. Course Plan

Learning Objective	Topics to be covered	No of Lec.	Ref. to Ch. In TB, IS code
General requirement for satisfactory performance of shallow foundations	General principles, concepts, requirement for satisfactory performance of foundations, Types of foundations, selection and their specific applications.	2	IS 1904 R2
Bearing capacity of shallow foundations	Failure mechanism, generalized bearing capacity equation, local and punching shear failures, corrections for size, shape, depth, water table, compressibility etc., Selection of shear strength parameters, Bearing capacity analysis of footings on layered soils and slopes.	3	12TB, IS6403, IS8009-part1,



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Allowable soil pressure for shallow foundation and raft	Different approaches for determination of allowable soil pressure for cohesionless and cohesive soils from lab and field tests (SPT, CPT, PLT etc.)	2	12TB, IS6403, 8009-part1, R1, R2
Footings subjected to eccentric-inclined loads,	Effect of load eccentricity and inclination due to wind, earthquake etc, on pressure distribution, bearing capacity, tilt and settlement.	2	IS6403, R1, R2, notes
Proportioning of shallow foundations	Proportioning of isolated footings, strip, rectangular and trapezoidal combined footings – strap – balanced footings, proportioning of footings subjected to combined vertical, moment and horizontal loads	3	14 TB, Class notes
Deep Foundations classification, selection and construction	Types of deep foundations and their applications, selection, general requirements, driven and bored piles, pre-cast and cast in-situ piles, under-reamed piles, pier and well foundations, Indian case histories.	2	15 TB, IS2911
Piles capacity and settlement	Load carrying capacity of piles using static analysis, SPT, SCPT, dynamic method, load tests, Negative skin friction and estimation of down drag, uplift resistance, settlement for single pile and pile group, Capacity of under-reamed piles.	3	15 TB, IS2911
Laterally loaded Pile	Various methods for laterally loaded pile analysis (IS 2911, Broms, Reese and Matlock methods of analysis etc.)	2	16 TB, IS2911
Dynamic Properties of Soil	Dynamic properties of soil, using laboratory and field tests. Evaluation and interpretation of geotechnical reports, selecting foundation design parameters from laboratory and field tests. Code of practices.	2	R4 (IS 5249)
Analysis and design of foundations for different type of machines.	General requirements and design criteria - Stiffness and damping parameters, Analysis and design of block and frame foundations for reciprocating engines, impact type machines, rotary type machines, turbo generator. Limitations of BIS code of practices	3	IS 2974
Stability of slopes and embankments	Stability of slopes, limit equilibrium methods, methods of slices, highway embankments	2	10 TB, IRC-75, IRC-SP-58
Earth pressures	Various theories for computation of earth	3	11 TB,



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theories	pressures, Earth Pressure theories, Coulomb and Rankine approaches, smooth and rough walls, inclined backfill, depth of tension crack, lateral pressure due to surcharge loads, seismic earth pressure		IS1893-part3, IRC:6
Selection and analysis of retaining walls,	Classification and selection of different type of retaining walls. Analysis of different type of retaining walls, stability condition, Advantages and applications of reinforced earth walls, Indian case histories,	3	19 TB, R5
Designing with geosynthetics	Introduction to designing with geosynthetics, for various applications such as foundation, GRS wall & slopes, roads, drainage and filtration.	4	R4, notes
Ground improvement techniques principals, advantages, limitations, cost.	Soil stabilization and ground improvement techniques for difficult or problematic ground conditions - soft soils, loose sands, expansive or collapsible soils, etc., anti-liquefaction measures, preloading, vertical drains, stone columns, Insitu densification, heavy tamping, grouting, micropile etc., geosynthetics and reinforcing techniques using waste and natural material. Successful case histories.	3	21 TB, 29, 30, 31R3,IRC guidelines, IS 13094 , IS 15284 : Part 1,2,other IS codes and notes
Repair and strengthening measures for existing and new foundations.	Repair and strengthening measures for existing and new foundations. Underpinning procedure, enlarging size of foundation, adding piles, micropiling, soil nailing, sheet pile, helical piles, grouting, etc. Successful case histories.	2	Notes, case histories
Introduction to geotechnical earthquake engineering and liquefaction of soils	Basics of soil dynamics, seismic design guidelines for foundations and geotechnical structure, liquefaction of soil, screening criterion, evaluation of liquefaction potential.	3	R5,IS1893-part1,3,4,IS1893-part,5(draft), code of practices
	Total	44	

5. Evaluation Scheme:

Component	Duration	Weightage	Date & Time	Remarks
Mid Sem Test	90 min	25	6/10 2:00 - 3:30 PM	Open Book
Tutorial/Assignments	-	35	Continuous	Closed Book





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Comprehensive	3 hrs	40	9/12 FN	Closed
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6. Chamber Consultation Hour: To be announced in the class

7. Reading assignments will be given whenever necessary.

8. Make-up Policy: Make-up would be granted only for genuine cases with **prior permission**.

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

Instructor-in-charge



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