

# e-Book on Concepts and Techniques in Geotechnical and Foundation Engineering - Web course

## COURSE OUTLINE

This is in the nature of a 'covering' course for students who are undergoing or have undergone courses in Geotechnical Engineering and Foundation Engineering, at the undergraduate or postgraduate level. It is prepared as a learning aid in the hands of the student and a teaching aid in the hands of the teacher. Geotechnical and foundation engineering professionals will also find the material useful in reinforcing their understanding of the subject they are dealing with. The course material consists of text, figures (with ANIMATION), audio and video clippings, the latter wherever necessary and possible. Text and figures will also adopt a colour scheme to differentiate and highlight the material in the order of importance. In short, the course is designed to create an environment of effective learning of the subject matter on an e-platform.

## COURSE DETAIL

Sl. No.	Topic
1	Void ratio – porosity: general relationship Total and effective stress – a theoretical building block
2	Shear strength – Mohr-Coulomb failure criterion
3	Earth pressure – active and passive – similarity with 'arching' - active earth pressure on stem of cantilever retaining wall – implied assumption



# NPTEL

<http://nptel.iitm.ac.in>

## Civil Engineering

### Pre-requisites:

Basic courses in geotechnical engineering and foundation engineering

### Additional Reading:

1. Kurian, N. P. An Introduction to Modern Techniques in Geotechnical and Foundation Engineering, Narosa Publishing House, New Delhi, Alpha Science International, U. K., 2013.
2. Kurian, N. P., Shell Foundations – Geometry, Analysis, Design and Construction, Narosa Publishing House, New Delhi, Alpha Science International, U.K., 2006.

### Coordinators:

**Dr. Nainan P. Kurian**

	Submerged unit weight – combined earth and water pressures
4	Bearing capacity – relevance of shear failure – ‘skirted footings’
5	Permeability: water table, hydraulic gradient, quick sand, filters
6	Consolidation – short term and long term performance Compaction – wet and dry densities
7	Foundation design phases – geotechnical design – bearing capacity and settlement factors ‘net loading intensity’ – influence of water table on geotechnical design
8	Compensated rafts
9	Special piles – inclined pile, tapered pile, underreamed pile, screw pile ‘Thermal analogy’ for analysing expansive soils and foundations interacting with expansive soils
10	Negative skin friction Pile group action Piled rafts
11	Soil pressure for structural design’ – in normal and swelling soils. Spring bed analogy for soils Column action – soil reaction
12	Soil-structure interaction – continuous elastic and Winkler models Nonliner Winkler model, continuous Winkler model Influence of rigidity on differential settlements
13	Conical, spherical and hypar shell foundations Installation of precast shell foundation by ‘centrifugal blast compaction’

14	Plate bearing test Standard penetration test Pile load tests
15	Cantilever footing – construction Simplex pile – construction Underreamed pile construction, half bulb Cut support by ‘prestressing’ struts
16	Pile driving – by hammer impact, vibration Driving steel, R.C. sheet piles Well foundation – sinking
17	Drainage by well points – lowering of ground water table Foundation dewatering
18	Stabilisation of boreholes and trenches by drilling mud
19	Reinforced earth – principle – Telescope and Hitex methods of construction Back-to-back construction of reinforced earth vs. continuous strips Reduction of settlement by reinforced earth Soil nailing
20	Diaphragm walls – construction, trench cutter Ground anchors – construction, uses
21	Bored piles - construction Bored pile walls – secant piles, tangent piles, intermittent piles Metro lines – construction by the ‘cut and cover’ method
22	‘Gabions’ for retaining structures Terramesh and Green Terramesh for slope stabilisation
23	Retaining wall with relieving shelves

	Controlled yielding technique to reduce lateral earth pressure
24	Vibroflot – rotation of eccentric mass Vibrocompaction Vibroreplacement, stone columns
25	Soilcrete Soilfrac
26	Dynamic compaction
27	Sand drains Vacuum consolidation
28	Pile dynamic testing
29	Pressuremeter testing Centrifugal testing of geotechnical models
30	Dilatometer testing Piezocone testing
31	V-piles – static installation Box jacking
32	Sanitary Landfill construction Bamboo-reinforced soil-cement for rural construction
33	Petronas and Burj Khalifa Towers – piled-raft foundation Construction of the Suez and Panama Canals
34	Geotechnical intervention in the restoration of the Leaning Tower of Pisa
35	Prestressed concrete piles – splicing

36	Granular anchor piles in expansive soils
37	Multistoreyed structures with basement – Top-down construction
38	R.C. pavement construction
39	Statnamic, Osterberg tests
40	Dilatometer testing Piezocone testing
41	Cathodic protection of marine structures
42	Beach Management System General
43	Functions and Scales
44	SI Units

#### References:

1. Gulhati, S. K. And Datta, M. J. Geotechnical Engineering, Tata McGraw-Hill Publ. Co. Ltd., New Delhi, 2005.
2. Venkatramaiah, C. Geotechnical Engineering, (3rd edn.) New Age International Publishers, New Delhi, 2006.
3. Kurian, N. P. Design of Foundation Systems –Principles and Practices (3rd edn.) Narosa Publishing House, New Delhi, Alpha Science International, U.K.,2005.