

Course No.: SWCE-232

Course Title: Soil Mechanics

Semester: III

Credits: 2(1+1)

Syllabus

Theory:

Introduction of soil mechanics, field of soil mechanics, phase diagram, physical and index properties of soil, classification of soils, effective and neutral stress, elementary concept of Boussinesq and Westergaard analysis, new mark influence chart. Seepage Analysis; Quick condition-two dimensional flow-Laplace equation, Velocity potential and stream function, Flow net construction. Shear strength, Mohr stress circle, theoretical relationship between principal stress circle, theoretical relationship between principal stress, Mohr coulomb failure theory, effective stress principle. Determination of shear parameters by direct shear test, triangle test & vane shear test. Numerical exercise based on various types of tests. Compaction, composition of soils standard and modified proctor test, abbot compaction and Jodhpur mini compaction test field compaction method and control. Consolidation of soil: Consolidation of soils, one dimensional consolidation spring analogy, Terzaghi's theory, Laboratory consolidation test, calculation of void ratio and coefficient of volume change, Taylor's and Casagrande's method, determination of coefficient of consolidation. Earth pressure: plastic equilibrium in soils, active and passive states, Rankine's theory of earth pressure, active and passive earth pressure for cohesive soils, simple numerical exercises. Stability of slopes: introduction to stability analysis of infinite slope and finite slopes friction circle method, Taylor's stability number.

Teaching Schedule- Theory with weightages (%)

Lecture No.	Topic	Book No.	Article No.	Weightage s (%)
1	Introduction of soil mechanics, field of soil mechanics.	1	1.1, 1.3,	25
2, 3, 4	Soil as a three phase system, voids ratio, porosity and degree of saturation, functional relationship and numerical	1.	2.1, 2.4, 2.6	
5, 6	Index properties of soil: water content, specific gravity, particle size distribution, consistency limits, in-situ density and density index,	1.	3.1, 3.2, 3.3, 3.4, 3.10, 3.13	30
7	Classification of soils, particle size classification and textural classification	1.	4.1, 4.2, 4.3	
8,9	Compaction, Standard Proctor Test, Modified Proctor Test, Abbot compaction test, Jodhpur Mini-Compaction test, Field compaction methods and field compaction control.	1	17.1, 17.2, 17.3, 17.6, 17.7, 17.8, 17.10	20
10,11	Consolidation of soils, one dimensional consolidation spring analogy, Tergazi's theory of one dimensional consolidation, laboratory consolidation test, calculation of voids ratio and coefficient of volume change	1	15.1, 15.2, 15.5, 15.7, 15.8	
12,13	Effective stress principle, Determination of shear parameters by direct shear test and numericals.	1	18.4,18.5,18.6	25
14, 15	Earth pressure: plastic equilibrium in soils :active and passive states, Rankine's theory of earth pressure, active earth pressure for cohesive soils, passive earth pressure for cohesive soils	1	20.1, 20.2, 20.4, 20.5, 20.6	
16	Stability of slopes: stability analysis of infinite slopes	1	23.1, 23.2,	

Practical Exercises

Exercise No.	Title
1.	Determination of water content of soil by oven drying method.
2.	Determination of specific gravity of soil by pycnometer method.
3.	Determination Water content of soil by pycnometre method.
4.	Determination of field density of soil by core cutter method.
5.	Determination of field density of soil by sand replacement method.
6.	Mechanical analysis of soil by sieving.
7.	Determination of grain size distribution by hydrometer method.
8.	Determination of liquid limit by Casagrande's method;
9.	Determination of plastic limit of soil.
10.	Determination of shrinkage limit of soil.
11.	Determination of permeability by constant head method;
12.	Determination of permeability by variable head method;
13.	Determination of compaction properties of soil by standard proctor test.
14.	Determination of unconfined compression test parameters.
15.	Determination of triaxial shear strength of soil
16.	Determination of consolidation properties of soils.

Suggested readings

Text Book:

1. Punmia, B. C., Jain, A. K. and Jain A. K. 2005. Soil Mechanics and Foundations. Laxmi Publications(P) Ltd. New Delhi.

Reference Books:

1. RanjanGopal and Rao, A. S. R. 1993. Basic and Applied Soil Mechanics. Welley Easters Ltd., New Delhi.
2. Singh Alam. 1994. Soil Engineering Vol. I. CBS Publishers and Distributions, Delhi.