**LESSON PLAN - CE 1018 - GEOTECHNICAL ENGINEERING - I**
**Academic year 2015-16**
**(Semester commencing in June 2015)**

**Instructional Objectives**

| Instructional Objective No. | Instructional Objectives (IO) |
|---|---|
| 1 | Provide the description and classification of soil and analysis of stresses in soils under different loading conditions |
| 2 | Familiarize the students an understanding of permeability and seepage of soils |
| 3 | To know about the consolidation and compaction effect on soil in lab and field. |
| 4 | To develop an understanding of the principles of effective stress in saturated soils, and its application to one dimensional compression and consolidation |

**Student Outcomes**

| Student Outcomes No. | Student Outcome (SO) |
|---|---|
| a | An ability to apply knowledge of mathematics, science, and engineering |
| e | An ability to identify, formulate and solve engineering problems |
| k | An ability to use the techniques, skills and modern engineering tools necessary for engineering practice |

**Mapping of Instructional Objectives (IOs) with Student Outcomes (SOs)**

**CE 1018 - GEOTECHNICAL ENGINEERING – I**

| Instructional Objective No | Instructional Objectives (IO) | Student Outcomes | | |
|---|---|---|---|---|
| | | a | e | k |
| 1 | Provide the description and classification of soil and analysis of stresses in soils under different loading conditions | x | x | |
| 2 | Familiarize the students an understanding of permeability and seepage of soils | x | x | |
| 3 | To know about the consolidation and compaction effect on soil in lab and field. | x | x | x |
| 4 | To develop an understanding of the principles of effective stress in saturated soils, and its application to one dimensional compression and consolidation | x | x | x |

| CE 1018 | GEOTECHNICAL ENGINEERING - I | Lecture Hours (L) | Tutorial Hours (T) | Practical Hours (P) | Credits (C) |
|---|---|---|---|---|---|
| | | **2** | **2** | **0** | **3** |
| | **Prerequisites - Nil** | | | | |

**Lesson Plan – 2015-16**                                    **Revision: 0  dated 26/06/2015**

| Lecture No. | Topic | No. of Hours | Instructional Objectives | Student Outcome | References |
|---|---|---|---|---|---|
| | **UNIT I - INTRODUCTION** | | | | |
| 1 | Definition of Soil and Soil Mechanics- Formation of soils | 1 | 1 | a | 1,2,3 |
| 2 | Type of Soils - Basic definition in soil mechanics | 2 | 1 | a, e | 1,2,3 |
| 3 | Three phase systems & relationships | 3 | 1 | a, e | 1,2,3 |
| 4 | Specific gravity - Pycnometer and density bottle methods | 2 | 1 | a | 1,2,3 |
| 5 | Field density from sand replacement and core cutter method | 3 | 1 | a, e | 1,2,3 |
| | Cycle Test 1 | 2 | | | |
| | **UNIT II - INDEX PROPERTIES** | | | | |
| 6 | Classification of soil - Grain size analysis | 2 | 1 | a,e | 1,2,3 |
| 7 | Stoke's law and hydrometer analysis | 2 | 1 | a,e | 1,2,3 |
| 8 | Consistency - Atterberg limits | 2 | 1 | a,e | 1,2,3 |
| 9 | PI, LI, CI, SR, FI & TI Problems | 2 | 1 | a,e | 1,2,3 |
| 10 | Classification of coarse grained and fine grained soils as per BIS | 3 | 1 | a,e | 1,2,3 |
| | **UNIT III - PERMEABILITY AND SEEPAGE** | | | | |
| 11 | One dimensional flow through soil - Permeability – Assumptions- Darcy's law - Limitations | 2 | 2 | a,e | 1,2,3 |
| 12 | Field and laboratory permeability tests | 3 | 2 | a,e | 1,2,3 |
| 13 | Permeability in stratified soils - factors affecting permeability | 2 | 2 | a,e | 1,5,6 |
| 14 | Introduction to flow nets – Properties – Applications – Discharge Velocity and seepage Velocity | 3 | 2 | a,e | 1,2,3 |
| | Cycle Test 2 | **2** | | | |
| | **UNIT IV - COMPACTION AND CONSOLIDATION** | | | | |
| 15 | Compaction - Proctor's test | 2 | 3, 4 | a,e | 1,2,5 |
| 16 | Field compaction methods - factors affecting compaction – effect of compaction in soil properties | 2 | 3, 4 | a,e,k | 1,2,3,4 |
| 17 | California Bearing Ratio test | 2 | 3, 4 | a,e,k | 1,2,3,4 |
| 18 | Consolidation - definition - Terzaghi's theory of one dimensional consolidation partial differential equations ( no analytical) | 2 | 3, 4 | a,e | 1,2,3,4 |

| | | | | | |
|---|---|---|---|---|---|
| 19 | Laboratory test - Determination of co-efficient of consolidation- √t and log t methods. | 2 | 3, 4 | a,e | 1,2,3,4 |
| **UNIT V - STRESS DISTRIBUTION AND SHEAR STRENGTH** | | | | | |
| 20 | Stresses in soils - concept of effective and neutral stresses | 2 | 1, 4 | a,e,k | 1,5,6 |
| 21 | stress distribution in soil media - Boussinesq - – point load, uniformly distributed load, line load, rectangular load | 2 | 1, 4 | a,e,k | 1,2,3 |
| 22 | Westergards equation – point load, uniformly distributed load, line load, rectangular load - Pressure bulb – Newmark's chart – Introduction. | 2 | 1,4 | a,e,k | 1,2,3 |
| 23 | Shear strength - Shear strength of cohesive and cohesionless soils - Mohr - coulomb's - theory - Laboratory and field test: Direct shear test | 2 | 1,4 | a,e,k | 1,2,3 |
| 24 | triaxial and unconfined shear strength test – lab and field vane shear test - factors affecting shear strength. | 3 | 1,4 | a,e,k | 1,2,3 |
| | **Model Examination** | 3 | | | |
| | **Total Hours** | 60 | | | |

**TEXT BOOKS**
1. Raju K.V.B. & Ravichandran P.T, *Mechanics of Soils*, Ayyappaa Publications, 2000
2. Punmia B.C., *Soil Mechanics and Foundations*, Laxmi Publications Pvt. Ltd., 2000
3. Gopal Ranjan, Rao.A.S.R., *Basic and Applied Soil Mechanics*, Wiley Eastern Ltd., 2000

**REFERENCE BOOKS**

4. Terzaghi K., Peck R.B., *Soil Mechanics in Engineering Practice*, John Wiley Ltd., 1967
5. Lambe T.W., Whitman, *Soil Mechanics*, John Wiley Ltd., 1979.
6. Arora .K.R, "Soil Mechanics and Foundation Engineering", Standard Publication Distributors , 2011.

**Course Coordinator : Dr.P.T.Ravichandran**

**Faculty handling the courses :**

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