# Mohamed Sathak A.J college of Engineering, Chennai.

DEPARTMENT OF CIVIL ENGINEERING

## LESSON PLAN

| Course/Branch | : | B.E Civil Engineering | | Total no. of hours given in syllabus: | | |
|---|---|---|---|---|---|---|
| Subject Code | : | **CE8491** | | Lecture | : | 45 |
| Subject Title | : | SOIL MECHANICS | | Tutorials | : | 0 |
| Year/Semester | : | II/IV | | Practical | : | 0 |
| Faculty Name | : | Mrs. V.Janaki | | **TOTAL** | : | **45** |
| Regulation | : | 2017 | | **Credits** | : | **03** |

**COURSE OBJECTIVES** :

## The student should be made to:

The objective of this course is to classify the soil based on index properties and to assess their engineering properties based on the classification. To familiarize the students about the fundamental concepts of compaction, flow through soil, stress transformation, stress distribution, consolidation and shear strength of soils. To impart knowledge of design of both finite and infinite slopes.

**COURSE OUTCOMES**:

Upon completion of the course, the student should be able to:

- Classify the soil and assess the engineering properties, based on index properties.

- Understand the stress concepts in soils

- Understand and identify the settlement in soils.

- Determine the shear strength of soil

- Analyze both finite and infinite slopes.

| Sl.No. | Topic | No. of Periods | Text / Reference Books | Page No. | Method |
|---|---|---|---|---|---|
| **UNIT I** | **SOIL CLASSIFICATION AND COMPACTION** | | | | **9** |
| **Objective:** The objective of this unit is to help students to develop the ability to classify soil and its components | | | | | |
| 1 | History – formation and types of soil | 1 | T4 | 1-4 | Chalk and Board |
| 2 | composition - Index properties | 1 | T4 | 5-7 | Chalk and Board |
| 3 | Classification | 1 | T4 | 8,9 | Chalk and Board |
| 4 | phase relationship | 1 | T4 | 15-22 | Chalk and Board |
| 5 | Compaction– theory – laboratory and field technology | 2 | T4 | 26-34 | Chalk and Board |
| 6 | Field Compaction method - Factors influencing compaction | 1 | T4 | 36-44 | Chalk and Board |
| 7 | Problems | 2 | T4 | 45-58 | Chalk and Board |
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| **UNIT II** | **EFFECTIVE STRESS AND PERMEABILITY** | | | | **9** |
| **Objective:** The objective of this unit is to help students to develop the ability to find the effective stress and permeability | | | | | |
| 8 | Soil - water – Static pressure in water | 1 | T4 | 75-80 | Chalk and Board |
| 9 | Effective stress concepts in soils | 1 | T4 | 81-86 | Chalk and Board |
| 10 | Capillary phenomena | 1 | T4 | 94-99 | Chalk and Board |
| 11 | Permeability – Darcy's law | 1 | T4 | 102-110 | Chalk and Board |
| 12 | Determination of Permeability – Laboratory Determination (Constant head and falling head methods) | 2 | T4 | 111-125 | Chalk and Board |
| 13 | Field measurement pumping out in unconfined and confined aquifer – Factors influencing permeability of soils | 1 | T4 | 126-134 | Chalk and Board |
| 14 | Seepage - Two dimensional flow –Laplace's equation | 1 | T4 | 142-148 | Chalk and Board |
| 15 | Introduction to flow nets – Simple problems Sheet pile and wier. | 1 | T4 | 158-163 | Chalk and Board |

| UNIT III | STRESS DISTRIBUTION AND SETTLEMENT | | | | 9 |
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**Objective:**
The objective of this unit is to help students to develop the ability to analyse the various stress distribution

| 16 | Stress distribution in homogeneous and isotropic medium | 1 | T4 | 194-198 | Chalk and Board |
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| 17 | Boussinesq theory | 1 | T4 | 200-204 | Chalk and Board |
| 18 | Use of Newmarks influence chart | 1 | T4 | 205-208 | Chalk and Board |
| 19 | Components of settlement | 1 | T4 | 208-210 | Chalk and Board |
| 20 | Immediate and consolidation settlement – Factors influencing settlement | 1 | T4 | 211-215 | Chalk and Board |
| 21 | Terzaghi's one dimensional consolidation theory | 2 | T4 | 216-225 | Chalk and Board |
| 22 | Computation of rate of settlement. – $\sqrt{t}$ and log t methods. | 1 | T4 | 225-227 | Chalk and Board |
| 23 | e-log p relationship consolidation settlement- N-C clays – O.C clays – Computation. | 1 | T4 | 228-231 | Chalk and Board |

| UNIT IV | SHEAR STRENGTH | | | | 9 |
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**Objective:**
The objective of this unit is to help students to develop the ability to apply the concept of shear strength

| 24 | Shear strength of cohesive and cohesion less soils | 1 | T4 | 256-260 | Chalk and Board |
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| 25 | Mohr-Coulomb failure theory | 1 | T4 | 261-264 | Chalk and Board |
| 26 | Shear strength - Direct shear, | 1 | T4 | 265-267 | Chalk and Board |
| 27 | Triaxial compression | 2 | T4 | 270-275 | Chalk and Board |
| 28 | UCC and Vane shear tests | 2 | T4 | 276-284 | Chalk and Board |
| 29 | Pore pressure parameters | 1 | T4 | 286-290 | Chalk and Board |
| 30 | Factors influences shear strength of soil. | 1 | T4 | 291-295 | Chalk and Board |

| UNIT V | SLOPE STABILITY | | | | 9 |
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**Objective:**
The objective of this unit is to help students to develop the ability to identify various slope stabilities of soils.

| 31 | Infinite slopes and finite slopes | 2 | T4 | 300-312 | Chalk and Board |
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| 32 | Friction circle method | 2 | T4 | 315-320 | Chalk and Board |
|----|------------------------|---|----|---------|-----------------|
| 33 | Use of stability number | 1 | T4 | 321-323 | Chalk and Board |
| 34 | Guidelines for location of critical slope surface in cohesive and c - soil | 2 | T4 | 325-331 | Chalk and Board |
| 35 | Slope protection measures. | 2 | T4 | 332-341 | Chalk and Board |

**Assignment / Case Studies / Tutorials /Quiz / Mini Projects / Model Development / Task**

1. Problems on constant head and falling head method

2. Problems on shear strength of soil

**TEXT BOOK**

- Murthy, V.N.S., "Text book of Soil Mechanics and Foundation Engineering", CBS Publishers Distribution Ltd., New Delhi. 2014
- Arora, K.R., "Soil Mechanics and Foundation Engineering", Standard Publishers and Distributors, New Delhi, 7th Edition, 2017(Reprint).
- Gopal Ranjan, A S R Rao, "Basic and Applied Soil Mechanics" New Age International Publication, 3rd Edition, 2016.
- Punmia, B.C., "Soil Mechanics and Foundations", Laxmi Publications Pvt. Ltd. New Delhi,16th Edition, 2017.

**REFERENCES:**

- McCarthy, D.F., "Essentials of Soil Mechanics and Foundations: Basic Geotechnics".Prentice-Hall, 2006.
- Coduto, D.P., "Geotechnical Engineering – Principles and Practices", Prentice Hall of India Pvt. Ltd. New Delhi, 2010.
- Braja M Das, "Principles of Geotechnical Engineering", Cengage Learning India Private Limited, 8th Edition, 2014.
- Palanikumar.M., "Soil Mechanics", Prentice Hall of India Pvt. Ltd, Learning Private Limited Delhi, 2013.
- Purushothama Raj. P., "Soil Mechanics and Foundations Engineering",2nd Edition, Pearson Education, 2013.
- Venkatramaiah.C., "Geotechnical Engineering", New Age International Pvt. Ltd., New Delhi,

**PREPARED BY,**                                        **APPROVED BY,**

**Mrs. V.JANAKI**                                        **Mr.**
**(AP/CIVIL)**                                           **(HOD/CIVIL)**