

SARDAR RAJA COLLEGE OF ENGINEERING, ALANGULAM

DEPARTMENT OF CIVIL ENGINEERING

MICRO LESSON PLAN



SUBJECT : SOIL MECHANICS

CODE : CE 2251

CLASS : II Year / IV SEM

STAFF NAME: Prof.S.RAJA GOMATHI,

A.P, DEPT. OF CIVIL ENGG.

OBJECTIVE

After undergoing this course, the student gains adequate knowledge on engineering properties of soil.

UNIT I INTRODUCTION**10**

Nature of Soil - Problems with soil - phase relation - sieve analysis - sedimentation analysis – Atterberg limits - classification for engineering purposes - BIS Classification system - Soil compaction - factors affecting compaction – field compaction methods and monitoring.

UNIT II SOIL WATER AND WATER FLOW**8**

Soil water – Various forms – Influence of clay minerals – Capillary rise – Suction - Effective stress concepts in soil – Total, neutral and effective stress distribution in soil - Permeability – Darcy’s Law- Permeability measurement in the laboratory – quick sand condition - Seepage – Laplace Equation - Introduction to flow nets –properties and uses - Application to simple problems.

UNIT III STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT**10**

Stress distribution in soil media – Boussinesque formula – stress due to line load and Circular and rectangular loaded area - approximate methods - Use of influence charts – Westergaard equation for point load - Components of settlement - Immediate and consolidation settlement - Terzaghi's one dimensional consolidation theory – governing differential equation - laboratory consolidation test – Field consolidation curve – NC and OC clays - problems on final and time rate of consolidation

UNIT IV SHEAR STRENGTH**9**

Shear strength of cohesive and cohesionless soils - Mohr - Coulomb failure theory – Saturated soil - Strength parameters - Measurement of shear strength, direct shear, Triaxial compression, UCC and Vane shear tests –Types of shear tests based on drainage and their applicability - Drained and undrained behaviour of clay and sand – Stress path for conventional triaxial test.

UNIT V SLOPE STABILITY**8**

Slope failure mechanisms - Modes - Infinite slopes - Finite slopes – Total and effective stress analysis - Stability analysis for purely cohesive and C- ϕ soils - Method of slices – Modified Bishop’s method - Friction circle method - stability number – problems – Slope protection measures.

TOTAL: 45 PERIODS**TEXT BOOKS**

1. Punmia P.C., “Soil Mechanics and Foundations”, Laximi Publications Pvt. Ltd., New Delhi, 1995.
2. Gopal Ranjan and Rao A.S.R., “Basic and applied soil mechanics”, New Age International Publishers, New Delhi, 2000.
3. Venkatramaiah, C. “Geotechnical Engineering”, New Age International Publishers, New Delhi, 1995
4. Khan I.H., “A text book of Geotechnical Engineering”, Prentice Hall of India, New Delhi, 1999.

REFERENCES

1. Coduto, D.P., “Geotechnical Engineering Principles and Practices”, Prentice Hall of India Private Limited, New Delhi, 2002.
2. McCarthy D.F., “Essentials of Soil Mechanics and Foundations Basic Geotechniques”, Sixth Edition, Prentice-Hall, New Jersey, 2002.
3. Das, B.M, “Principles of Geotechnical Engineering”, (fifth edition), Thomas Books/ cole, 2002
4. Muni Budhu, “Soil Mechanics and Foundations”, John Willey & Sons, Inc, New York, 2000.

DESCRIPTION

A study of soil types and properties is made with the objective of developing a basic understanding of soil behavior. The methods of subsurface investigation and compaction are presented. Fundamentals pertaining to permeability, seepage, consolidation, stress distribution, and shear strength are introduced. Settlement analysis is also presented.

OBJECTIVES

- ❖ Learn index properties of soils methods of soil classification and subsurface investigation
- ❖ Learn principle of seepage through porous media and effective stress.
- ❖ Learn principles of consolidation and shear strength.
- ❖ Recognise non-linear stress-strain relationship of granular materials
- ❖ Estimate shear modulus and stiffness of soil
- ❖ Determine the dynamic response of a sway frame to simplified earthquake motions
- ❖ Understand damping in the structure and in the soil
- ❖ Rocking of structure under earthquake loading

MICRO LESSON PLAN

| HOURS | LECTURER TOPICS | READINGS |
|---|---|----------|
| UNIT I INTRODUCTION | | |
| 1 | Nature of Soil | T1 |
| 2 | Problems with soil - phase relation | T1 |
| 3 | sieve analysis | T1 |
| 4 | sedimentation analysis | T1 |
| 5 | Atterberg limits | T1 |
| 6 | classification for engineering purposes | T1 |
| 7 | BIS Classification system | T1 |
| 8 | Soil compaction(AV class) | T1 |
| 9 | factors affecting compaction | T1 |
| 10 | Field compaction methods and monitoring | T1 |
| UNIT II SOIL WATER AND WATER FLOW | | |
| 11 | Soil water – Various forms – Influence of clay minerals | T1 |
| 12 | Capillary rise – Suction - Effective stress concepts in soil | T1 |
| 13 | Total, neutral and effective stress distribution in soil | T1 |
| 14 | Permeability–Darcy’s Law- Permeability measurement in the laboratory(AV class) | T1 |
| 15 | quick sand condition - Seepage | T1 |
| 16 | Laplace Equation | T1 |
| 17 | Introduction to flow nets –properties and uses | T1 |
| 18 | Application to simple problems | T1 |
| UNIT III STRESS DISTRIBUTION, COMPRESSIBILITY AND SETTLEMENT | | |
| 19 | Stress distribution in soil media – Boussinesque formula | T1 |
| 20 | stress due to line load and Circular and rectangular loaded area | T1 |
| 21 | approximate methods - Use of influence charts–Westergaard equation for point load | T1 |
| 22 | Components of settlement | T1 |
| 23 | Immediate and consolidation | T1 |

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| | settlement(AV class) | |
| 24 | Terzaghi's one dimensional consolidation theory | T1 |
| 25 | governing differential equation | T1 |
| 26 | Laboratory consolidation test | T1 |
| 27 | Field consolidation curve | T1 |
| 28 | NC and OC clays - problems on final and time rate of consolidation | T1 |
| UNIT IV SHEAR STRENGTH | | |
| 29 | Shear strength of cohesive and cohesionless soils | T1 |
| 30 | Mohr | T1 |
| 31 | Coulomb failure theory | T1 |
| 32 | Saturated soil | T1 |
| 33 | Strength parameters | T1 |
| 34 | Measurement of shear strength, direct shear, Triaxial compression, UCC and Vane shear tests(AV class) | T1 |
| 35 | Types of shear tests based on drainage and their applicability | T1 |
| 36 | Drained and undrained behaviour of clay and sand | T1 |
| 37 | Stress path for conventional triaxial test | T1 |
| UNIT V SLOPE STABILITY | | |
| 38 | Slope failure mechanisms - Modes - Infinite slopes - Finite slopes | T1 |
| 39 | Total and effective stress analysis | T1 |
| 40 | Stability analysis for purely cohesive and C- ϕ soils | T1 |
| 41 | Method of slices | T1 |
| 42 | Modified Bishop's method | T1 |
| 43 | Friction circle method | T1 |
| 44 | stability number – problems | T1 |
| 45 | Slope protection measures(AV class) | T1 |