Soil Mechanics

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Introduction

1. Importance of this course

- Soil mechanics is a basic compulsory course for undergraduate students in civil engineering.

What is Soil Mechanics?

- Soil mechanics may be defined as the study of the engineering behaviour of soils, with reference to the design of civil engineering structures made from or in the earth.

Examples of these structures include embankments and cuttings, dams, earth retaining wall, tunnels, basements, roads, sub-surface waste repositories, and the foundations of buildings and bridges.

2. Characteristics and engineering background of the course

- Soil mechanics is a practical engineering discipline that takes soils as the research objects, which is a branch of engineering mechanics.

- It is used to study the stress, strain, strength and stability of soils related to engineering constructions under the action of external factors (such as load, water, temperature etc.), using the principles of mechanics and geotechnical testing techniques.

Example

The Leaning Tower of Pisa, Italy

Basic information

- Location City of Pisa, Italy
- Geographic coordinate
  43° 43' 23"N, 10° 23' 47"E
- Groundbreaking 1173
- Completed 1372
- Height (max) 183.3 ft
- Leaned angle 5.5 degrees

- The leaning Tower of Pisa was designed as a circular bell tower that would stand 185 feet high. It is constructed of white marble. The tower has eight stories, including the chamber for the bells.

The Pisa Tower was built in several stages from 1173 to 1372. During this period, the construction stopped twice due to the tower inclination.

The tower's tilt started during the construction because that the south side of the soil mass supporting the foundation was too soft to properly support the structure's weight.

The plastic deformation of the foundation, creep, falling water tables, etc. accelerated the Tower inclination.

Circular excavations were used for unloading at the opposite side and grouting was carried out to reinforce the soil surrounding the foundation.

The body of the tower also reinforced to prevent it from collapse.

3. Main contents

1 Basic characteristics

2 Permeability of soils

3 Stress distribution

4 Compression of soils

5 Shear strength

6 Bearing capacity

7 Stability of slope

8 Lateral earth pressure

4. Requirements

1. To understand the concept of a three-phase composition of soil, parameters for physical properties and their relationship, soil permeability and the classification of soils.

2. To understand the theory of effective stress, the calculation methods for gravity stress, effective stress, foundation pressure and additional stresses.

3. To understand the compression characteristics of soils and the consolidation state, the method for calculating the foundation settlement.

4. To understand the strength theory , the shear strength indexes and test methods, failure characteristics of soils, and the calculation methods for ultimate loads.

5. To understand the basic concepts and calculation methods for earth pressure, the types of retaining structures; factors affecting the slope stability, the slope stability analysis methods.

(1) soil mechanics	土力学
(2) constitutive relation	本构关系
(3) ground	地基
(4) stress	应力
(5) strain	应变
(6) deformation	变形
(7) slope	边坡
(8) settlement	沉降
(9) earthquake	地震
(10) landslide	滑坡