

# SOIL MECHANICS

(E 3141)

## *General Information*

Time	11:00 - 11:50 p.m. (Lab, 706 MUDD, Tue or Thurs)
&	1:30 – 3:30 p.m. (Lecture, 627 MUDD, Wednesday)
Place	Note: Lab and lecture hours may be interchanged as necessary. Please leave the time slots open throughout the Semester
Textbooks	Lectures: Soils and Foundations, 6 <sup>th</sup> Edition, Prentice-Hall Lab: Soil Properties, Testing, Measurement, and Evaluation, 5 <sup>th</sup> edition, Prentice-Hall (both by C. Liu and J.B. Evett)
Instructor	Hoe Ling (632 MUDD) Office Hour: 1:00-3:00 p.m., Thursday Tel: (212)854-1203  E-Mail: <a href="mailto:Ling@civil.columbia.edu">Ling@civil.columbia.edu</a> , <a href="mailto:hl9@columbia.edu">hl9@columbia.edu</a>  <a href="http://www.civil.columbia.edu/~ling">http://www.civil.columbia.edu/~ling</a>
Teaching Assistant	Lab: Katy Shulte ( <a href="mailto:kes2115@columbia.edu">kes2115@columbia.edu</a> ) Assignments: Min-hao Wu (706 MUDD) Office hour: Monday, 2:00 - 3:00 p.m. Tel: (212)854-3153; E-Mail: <a href="mailto:mw2010@columbia.edu">mw2010@columbia.edu</a>

## *Course Outline*

- **Introduction and soil properties**  
Basic definitions, index properties, soil classification, compaction
- **Permeability and seepage**  
Darcy's law, determination of permeability, flow nets
- **Stresses in a soil mass**  
Stresses and pore pressure, effective stress concept, stress increment subject to surface loading
- **Shear strength of soil**  
Mohr's circle, Mohr-Coulomb failure criteria, direct shear, triaxial compression, shear strength of sands and clays
- **Compressibility of soil**  
Consolidation, consolidation settlement, rate of settlement
- **Applications**  
Bearing capacity of foundations, earth pressure

Note: Lecturers do not follow exactly the textbook. Attendance is suggested.

Examination questions are normally an extension of lectures/assignments.

## ***Lab Schedule***

- Grain size analysis and soil classification
- Atterberg limits
- Constant head permeability test
- Compaction test
- Two-dimensional flow net
- Direct shear test
- Triaxial test

### Note:

Time for the lab will be announced during the lecture. Attendance is compulsory

Laboratory reports shall be submitted within a week after conducting the experiments

## ***Grading***

The grade will be assigned based on the average of 2 exams (70%), lab reports (20%), and assignments (10%).

## **Soil Laboratory**

(Chapters corresponding to the Lab Textbook are indicated below)

### **Test 1: Grain Size Analysis**

9. Particle Size Analysis – Mechanical method

### **Test 2: Atterberg Limits**

3. Water Content Determination

6,7. Liquid and Plastic Limits of a Soil

### **Test 3: Constant Head Permeability Test**

17. Coefficient of Permeability – constant Head Method

18. Coefficient of Permeability – Falling Head Method

### **Test 4: Compaction Test**

11. Moisture Unit Weight Relationships (Compaction Test)

### **Test 5: Two Dimensional Flow Net**

(not available) – notes will be distributed

### **Test 6: Direct Shear Test**

22. Direct Shear Test

### **Test 7: Triaxial Test**

20. Unconfined Compression Test

21. Triaxial Test - Without Pore-Pressure Measurements