

# Soil Mechanics

**Third class**

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*silt and clay*

## INTRODUCTION

*Gypseous soil*

*Sand and gravel*



**Tikrit University**



**College of Engineering**

**Civil engineering Department**

# Soil Mechanics

**3<sup>rd</sup> Class**

**Lecture notes**

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# Contents

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- Course Outlines
- Lab Schedule
- Text Book and Recommended Readings
- Activities
- **Assessment**
- **Definitions**

# Course Outline



## First Semester

week	Topics Covered
1	Introduction
2	Soil Formation, Composition and Description of Individual Soil Particle, Forces on Soil Particle
3,4,&5	The Physical State of a Soil Sample Nature of Water in Clay, Consistency and Atterberg Limits Particle Size Distribution Unified Soil Classification System
6&7	Stresses Within a Soil Mass, Total and Effective Stresses, Capillarity
8,9&10	Fluid Flow in Soils, One Dimensional Flow
11,12&13	Two Dimensional Flow
14&15	Shear Strength of Soils,

# Course Outline



## Second Semester

week	Topics Covered
16&17	Coulomb Shear Strength Equation
18&19	Mohr-coulomb Failure Criterion
20,21, &22	Shear Tests (direct, triaxial, unconfined)
23	Stress Path
24	Soil Compaction
25	Compressibility of Soils, Consolidation
26	Consolidation Settlement
27&28	Introduction to unsaturated soil
29&30	Use of Plaxis software in soil mechanics

[Return](#)

# Course Outline (Lab Schedule)



## First Semester

week	Lab. Experiment Assignments
1	Introduction
2	How to write report, Type of soils
3	Water content
4	Specific gravity
5	Liquid limit
6	Plastic and Shrinkage limit
7	Sieve analysis
8	Hydrometer Analysis
9	Falling head permeability
10	Constant head permeability
11&12	Triaxial test
13&14	Consolidation drained
15	exam

# Course Outline (Lab Schedule)



## Second Semester

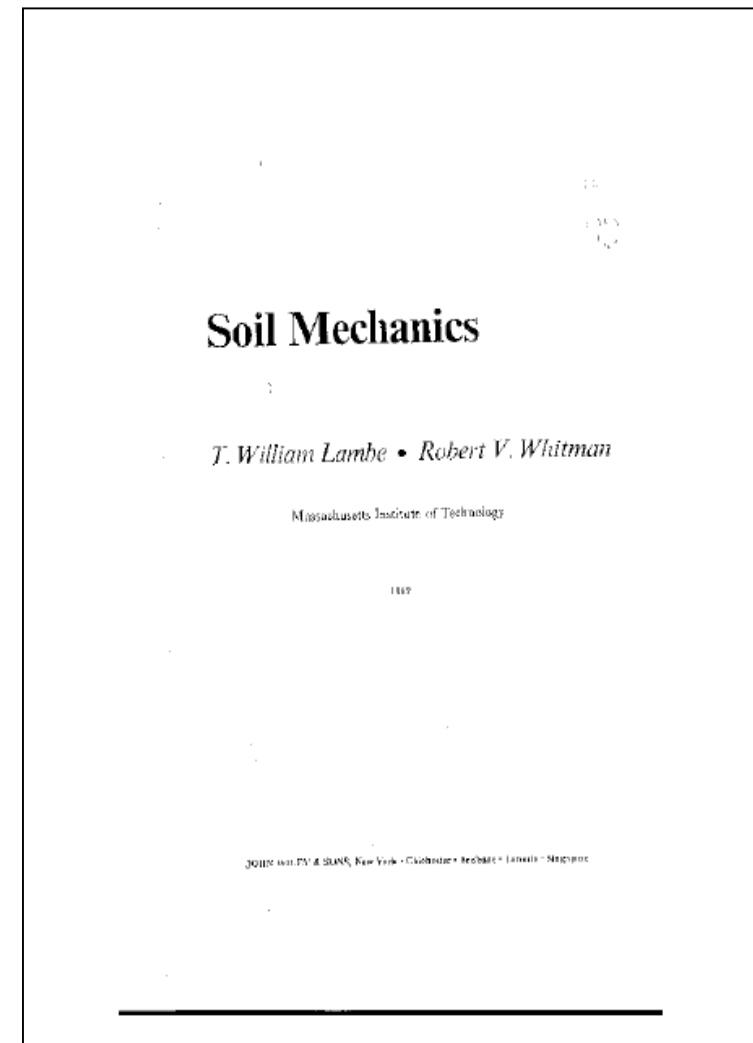
week	Lab. Experiment Assignments
16&17	Consolidated undrained
18&19	Unconsolidated undrained
20&21	Unconfined compression test
22&23	Direct shear test
24&25	Fielded density
26& 27	Compaction
28&29	Consolidation
30	Exam



# TEXT BOOK



## **Soil Mechanics** **Lambe, T and Witman, R** **1979** **John Wiley and Sons**





# Recommended Readings

**R. F. Craig**  
**Soil Mechanics**  
**Seventh Edition**  
**2004**  
**Spon Press**







# Activities

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## Lectures

- Theory and Principles
  - Examples
  - Homework
  - Quizzes
  - Applications
  - Lab
- 18 tests



# Assessment

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• <b>Exams</b>	<b>25%</b>
• <b>Quizzes</b>	<b>5%</b>
• <b>Homework and Assignments</b>	<b>5%</b>
• <b>Lab evaluation</b>	<b>15%</b>
• <b>Final Exam</b>	<b>50%</b>
	<hr/>
	<b>100%</b>



# Definitions

## SOIL AND SOIL ENGINEERING

\* The term Soil has various meanings, depending upon the general field in which it is being considered.

**\*To a Pedologist ...** Soil is the substance existing on the earth's surface, which grows and develops plant life.

**\*To a Geologist .....** Soil is the material in the relative thin surface zone within which roots occur, and all the rest of the crust is grouped under the term ROCK irrespective of its hardness.



# Definitions

**To an Engineer .... Soil is the un-aggregated or un-cemented deposits of mineral and/or organic particles or fragments covering large portion of the earth's crust. \*\***

**Soil Mechanics is one of the disciplines of Civil Engineering involving the study of soil, its behavior and application as an engineering material.**

**\*According to Terzaghi (1948): *"Soil Mechanics is the application of laws of mechanics and hydraulics to engineering problems dealing with sediments and other unconsolidated accumulations of solid particles produced by the mechanical and chemical disintegration of rocks regardless of whether or not they contain an admixture of organic constituent."***



# Definitions

**Geotechnical Engineering** .... Is a broader term for **Soil Mechanics**.

\* **Geotechnical Engineering contains:** -

- **Soil Mechanics (Soil Properties and Behavior)**
- **Soil Dynamics (Dynamic Properties of Soils, Earthquake Engineering, Machine Foundation)**
- **Foundation Engineering (Deep & Shallow Foundation)**
- **Pavement Engineering (Flexible & Rigid Pavement)**
- **Rock Mechanics (Rock Stability and Tunneling)**
- **Geosynthetics (Soil Improvement)**



# Definitions

**Soil material is the product of rock**

- **The geological process that produce soil is *WEATHERING (Chemical and Physical)*.**
- \* ***Variation in Particle size and shape depends on: -  
Weathering Process - Transportation Process***
- **Variation in Soil Structure Depends on:**
- ***Soil Minerals***
- ***Deposition Process***
- \* ***Transportation and Deposition***





# Definitions

***What type of soils are usually produced by the different weathering & transportation process***

- Boulders***
- Gravel Cohesionless***
- Sand (Physical)***
- Silt Cohesive***
- Clay (Chemical)***



# Definitions

- \* These soils can be - Dry**
- Saturated**
- Fully**
- Partially**
- \* Also they have different shapes and textures**