

CE 531 Advanced Soil Mechanics
Fall 2022

Instructor:

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Course Data: Hours: **TTT123**
 Room: **M1181 M1181 M1181**

Course Description
CE531 Soil Mechanics II

Overview of basic soil mechanics: Classification of soils, compaction, 1D flow, stresses, 2D flow, consolidation, strength, lateral earth pressure theories.

Introduction to advanced soil mechanics: Advances in soil classification, Intelligent Compaction, Flow in anisotropic soil profiles, finite difference method for modelling flow in soils, Mathematical concepts and relationships for defining and characterizing granular media. Definition and physical meaning of tensors, principal stresses, strains, and their invariants. Continuum mechanics notation. Particle-continuum duality. Introduction to unsaturated soil mechanics. Characteristics of soils such as stiffness, dilatancy, and strength. Definition of soil failure surfaces. Finite difference method for modelling consolidation. Theoretical introduction to constitutive modelling, physical modelling, theoretical modeling, numerical modeling, upper bound, lower bound, slip lines.

Course Objectives: This course is designed to introduce the basic principles of soil mechanics. The main idea is to help the students learn the necessary terminology and gain the skills and tools to pursue graduate research in geotechnical field on their own. In detail, the main objectives of this course are:

1. to know the necessary mathematical concepts and terminology to define physical problems
2. to understand the structural behavior of granular media
3. to grasp the essence of the behavior of particulate multiphase medium
4. to learn different methods of describing and quantifying engineering problems involving soils

Textbook:

- No textbook necessary. Required literature will be provided. However, students are encouraged to study from various literature.

Ref. Books:

- Chen, W.F., and Saleeb, A.F., “*Constitutive Equations for Engineering Materials Volume 1: Elasticity and Modeling*,” John Wiley&Sons, 1982.
- Chen, W.F., and Saleeb, A.F., “*Constitutive Equations for Engineering Materials Volume 2: Plasticity and Modeling*,” John Wiley&Sons, 1982.
- Davis, R.O. and Selvadurai, A.P.S., “*Elasticity and Geomechanics*,” Cambridge University Press, 1996.
- Davis, R.O. and Selvadurai, A.P.S., “*Plasticity and Geomechanics*,” Cambridge University Press, 2002.

- Wood, D.M., *“Soil Behaviour and Critical State Soil Mechanics,”* Cambridge University Press, 1990. TA710.W598 1990.
- Das, B.M., *“Advanced Soil Mechanics,”* McGraw-Hill, 1983.
- Wood, D.M., *“Geotechnical Modelling,”* Spon Press, 2004.
- Scott, R.F., *“Principles of Soil Mechanics,”* Addison-Wesley Publishing Company.
- Atkinson, J.H., *“Foundations and Slopes,”* McGraw-Hill, 1981.

Class Policies:

- Homeworks and quizzes: 35% of the final grade.
- Midterms: 30% of the final grade (in-class)
- Final: 35% of the final grade (in-class)
- Official communication method for this course is email. Please have an active email account.