General Information

Time: Tuesday, 4:10 – 6:40 pm
Room: 644 MUDD

References:


Office: 632 MUDD
Office Hour: Thursday, 11:00 - 13:00

Grading

Homeworks and Lab Reports (30%)
Midterm Examination (30%)
Final Examination (40%)
**Course Descriptions**

This Course is designed to integrate all aspects of geotechnical engineering at an advanced level. Students are required to conduct advanced soil testings (e.g., triaxial and plane strain compression tests). Characterizations of sand and clay are introduced using constitutive models, which are based on elastoplasticity. The modified Cam-clay model is implemented into coupled stress-flow finite element procedures. A final project is required where students conduct and compare the finite element results with the field measurements. MIT I-95 and Muar Test Embankments have been used as case histories and revisited using CRISP Program. A 30-minute presentation of the Final Project is required.

Note: The Final Report for this Course is as challenging as a Master's Thesis.

**Stress and Strain in Soils**
- States of Stress and Strain
- Mohr's Circle of Stress and Strain Increments
- Principal Stresses, Poles of Plane/Direction
- Plane of Maximum Stress Obliquity
- Plane of Zero Extension

**Stress-Strain-Strength Characteristics of Sand**
- Stress Conditions: Plane Strain, Triaxial, Simple Shear
- Triaxial and Plane Strain Compression Tests (Lab)
- Rowe's Stress-Dilatancy Relationships
- Stress Invariants
- Mohr-Coulomb Failure Criteria
- Failure Criteria under Three-Dimensional Stress Conditions
- Effects of Confining Stress, Intermediate Principal Stress, Bedding Plane, Stress Paths on Strength and Dilatancy
- Hyperbolic Model

**Critical State Soil Mechanics**
- Drained and Undrained Conditions
- Stress Path
- Consolidation and Dilatancy
- Critical State Line
- State Boundary Surface
- Modified Cam-Clay Model
- Cap Model

**Time-Dependent Behavior of Clay**
- Quasi Preconsolidation
- Creep and Stress Relaxation
- Singh-Mitchell Model
- Rheological Models

**Elasto-Plasticity in Finite Element Consolidation Analysis**
- Elasto-Plasticity
- Implementation of Modified-Cam Clay Model
- Biot's Theory
- Finite Element Formulation of Coupled Problem
- Introduction to Commercial Program (CRISP was used in previous classes)
- Case Study Analysis: MIT I-95 Test Embankment, Muar Test Embankment