1. **Course number and name**
   CE 3348 Geotechnical Engineering
2. **Credits and contact hours**
   3 credit hours; 2 lecture hour. 3 laboratory hour
3. **Instructor's or course coordinator's name**
   Dr. Reza Ashtiani
4. **Text book: title, author, and year**
   An Introduction to Geotechnical Engineering, 2nd edition by Holtz, Kovacs and Sheahan, Publisher: Prentice Hall, 2nd Edition, 2011

   a. Other supplemental materials
   Lecture note, lecture slides, class handouts, laboratory procedures, and other supplemental materials posted on class website.
5. **Specific course information**

   b. Description:
   Physical and mechanical properties of soils, plasticity, shrinkage, permeability seepage, consolidation, shear strength, Rankine and Coulomb earth pressure and braced cuts.
   Prerequisites or co-requisites:
   Pre-Requisite: CE 3336 wih a D or better
   Co-Requisite: CE2335 (GEOL3321) -Geological Engineering

   c. Indicate whether a required, elective, or selected elective course
   Required
6. **Specific goals for the course**

   a. Specific outcomes of instruction

   In this course, the students will learn how to determine the index properties of soils such as Atterberg limits and gradation parameters, and utilize this information to classify soils according to the Unified Soil Classification System (USCS) and AASHTO classification method. The students will also learn the principles that govern the flow of water in soils, and parameters that influence the permeability of fine grained and coarse grained soils. Further in the course, concepts pertaining to the pore water pressure, capillary rise, calculation of effective and total stresses will be discussed. Later, the students will learn how to use Boussinesq, Westergaard theories to calculate the external stresses in multi-layer soils. Upon learning the calculations of geostatic and external stresses, concepts pertaining to the shear strength of the soils will be discussed. The students will learn how to use Direct Shear Test (DST), and triaxial tests to estimate the cohesion and frictional properties of soils. Finally, the students will learn the governing principles of one dimensional consolidation theory and how to use odeometer test to calculate the time-dependent component of soil settlements.
7.
8. **Topics to be covered**

   a. Lectures:

   1. Weight-Volume Relationships (Phase Diagrams)

2. Atterberg Limits and Soil Plasticity
3. USCS and AASHTO Soil Classification Systems
4. Laboratory and Field Compaction
5. Pore Water Pressure, Effective and Total Stress Concepts
6. Geostatic Stress Calculations
7. External Stresses, Boussinesq, Westergaard Theories, New Mark Method, trapezoidal stress dissipation concepts.
8. Mohr's Circle of Stress
9. Shear Strength of Soils, Mohr-Coulomb Theory
10. Direct shear and Triaxial Tests
11. Consolidation Theory
12. Settlement Analysis of soils

b. Laboratory Tests:

1. *Laboratory Safety Workshop*
2. *Sieve Analysis*
3. *Atterberg Limits (Shrinkage Limit, Plastic Limit, and Liquid Limit)*
4. *Hydrometer Test*
5. *Compaction of Granular Soils: Standard Proctor Test (AASHTO T99)*
6. *Compaction of Granular Soils: Modified Proctor Test (AASHTO T180)*
7. *Particle Geometry-Aggregate Imagining System (AIMS)*
8. *Particle Geometry-Flat and Elongation Tests*
9. *Soil Strength-Direct Shear Test*
10. *Soil Strength-Triaxial Test*
11. *Consolidation Test*