

CE 4339 Geotechnical Design
Lecture Sessions: Monday/Wednesday/Friday 12:30 pm-1:20 pm
Spring 2023

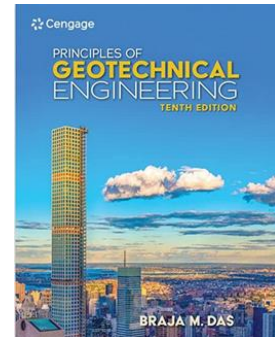
Instructor: Reza Ashtiani, Ph.D., P.E. (reza@utep.edu)

Engineering Annex. Room 217

Office Hours: Students are always welcome

Teaching Assistant: Edgar Rodriguez

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Textbook: Principles of Geotechnical Engineering,
10th Edition by B. Das, Publisher: Cengage Learning, 2020.

COURSE OBJECTIVES

The objective of this course is to provide civil engineering senior students with an in-depth understanding of the analysis and design of geo-structures. The main focus of the course will be on providing the students with the rationale behind the protocols available to geotechnical engineers to mechanistically design geo-structures and analyze soil-structure interactions. The course requires students to have sufficient background knowledge in geotechnical engineering and mechanics of materials.

Upon successful completion of this course, students will have gained knowledge in the following areas:

- **Physical Properties of Soils:** general concepts of soil mechanics such as soil texture and soil consistency. Particle size distributions and their relevance to engineering practice. Additional topics such as review field and laboratory compaction of soils will be discussed in detail.
- **Strength and Deformation of Soils:** Shear strength concept, Mohr-Coulomb failure criteria, triaxial tests, pore water pressure parameters, and the shear strength of soils in the field. Elastic settlements, Consolidation theory, settlement plots, normally consolidated and over consolidated clays, accelerated settlement and pre-compression of soils.
- **Analysis and Design of Geo-structures:** active and passive earth pressure, Rankin and Coulomb's theories, design of retaining structures, general concepts of shallow foundations, analysis of the bearing capacity of foundations, and slope stability.
- **Analysis and Design of Pavements:** Rigid vs. flexible pavements, factors influencing the fatigue and permanent deformation of pavements, AASHTO and AI design concepts, TxDOT method of design (TxME), geosynthetics, rehabilitation and maintenance of pavements.

SCHEDULE

A tentative lecture schedule is on the class website. Reading assignments from your text and handouts will be assigned in class at the end of each lecture session. Prepared notes will occasionally be handed out in class to supplement, or in some cases to substitute for, reading material from the book. Be sure to save the notes because you will be examined over at least some of the material in them.

<i>Topic No.</i>	<i>Description</i>
<i>1</i>	General Concepts Part 1: Soil Structure, Consistency of Cohesive Soils, plasticity, Clay Activity, Atterburg Limits, USCS and AASHTO Soil Classification.
<i>2</i>	General Concepts Part 2: Mohr Circle, Mohr-Coulomb Failure Criteria, Shear Strength in the Laboratory (Direct Shear Test, Triaxial Compression Test, CU, UU and CD tests),
<i>3</i>	Settlement Analysis of Soils: Consolidation Theory, Immediate Settlement in Granular Soils, Primary consolidation, Secondary Compression, Time Rate of Settlement, Methods for Accelerating Consolidation Settlements, Pre-compression.
<i>4</i>	Sub-Soil Exploration: Shear Strength in the Field (Vane Shear, CPT, SPT, PMT, CBR) In-Situ Tests, Boring Methods, Sampling Methods, Sample Distribution, Soil Exploration Reports.
<i>5</i>	Lateral Earth Pressure: At Rest Active and Passive Pressure, Rankin's Theory, Coulomb's Theory.
<i>6</i>	Retaining Structures: Design and Analysis of Gravity and Cantilever Walls, Stability Analysis, Overturning and Sliding along the base, Bearing Capacity Failure, Backfill Drainage.
<i>7</i>	Slope Stability: Stability Conditions for Analysis, End of Construction Stability, Long-term and Short term Stability Concepts.
<i>8</i>	Bearing Capacity of Shallow Foundations: Terzaghi's Ultimate Bearing Capacity Concept, Effect of Ground Water Table, Factor of Safety, One-Way and Two-Way Eccentricity.
<i>9</i>	Design of Pavement Structures: Rigid vs. Flexible Design, Modes of Failure, Distresses in Pavements, AASHTO and AI Design Concepts, Maintenance and Rehabilitation of Rigid and Flexible Pavements.
<i>10</i>	Design of Airfield Runways: Preliminary Concepts Governing the Pass to Coverage Ratio, Aircraft Wander, Complex Loading Conditions in Airfield Design, Civilian (FAA) vs. Military (Dod) Design Considerations.

GRADING

Your grade for this course will be determined on the basis of **1050 points** as follows:

1. Two mid-term exams (150 points each)
2. Final comprehensive examination (300 points)
3. Homework (250 points)
4. Term Project (250 points)
5. Critical Assessment (attendance and active participation in class discussions) (50 points)

In accordance with University regulations, students who miss examinations or fail to submit online exams will receive grade of zero. Exceptions to this rule will be made only on a carefully considered individual basis and only if the student contacts the instructor **before** the exam. If you know in advance that you are going to miss an exam, it is **your** responsibility to inform the instructor before the exam.

GRADE STRUCTURE

Final grades assigned for this course will be based on the percentage of total points earned and are assigned as follows:

Letter Grade	Percentage	Performance
A	90-100	Excellent Work
B	80-89	Very Good Work
C	70-79	Average Work
D	60-69	Below Average Work
F	0-59	Failing Work

HOMEWORK

All homework problems will be assigned in the class. The due date for homework submission is one week after the assigned date before 5:30 pm. Past experience clearly shows that a student's grade is strongly dependent upon the effort that is put into working and understanding the homework. Homework solutions will be available on due dates. Make sure to discuss the homework solutions with your teaching assistant, to properly understand the materials. We encourage that you team up with your other classmates for this activity. Please note that each student is responsible to submit the homework assignment individually.

EXAMINATIONS

Exam #1 and exam #2 will last between 60 minutes to 90 minutes. Exam #1 will cover topics 1-4 and Exam #2 will cover topics 5-8. The final comprehensive exam covers all the materials discussed in the class (topics 1-10). The list of the topics is presented on page 2 of this document. Final examination, which is comprehensive and covers all the course materials, will last two hours. ***You need to score***

above 50% in the final exam to pass the course.

COURSE COMMUNICATION

This will be a face-to-face class, with flexibility for virtual individual/group meetings throughout the semester. The virtual meetings are primarily for concept questions/problem solving and term project discussions. All instructional activities will be in person. Please consider the following for our CE4339 course communication:

- **Professor Office Hours:** Students are always welcome, please send me an email to arrange an in-person or virtual meeting if you were not able to find me in my office. I encourage you to initially discuss the questions about homework assignments with your TA, and if you still need further help please email me and I'll be happy to set up a meeting with you.
- **TA Office Hours:**
 - Tentative schedule is Tuesdays/Thursdays 1:30-4:00 pm.
 - Please email your TA to set up the appointment and details about meeting.
- **Email Correspondence:** UTEP e-mail is the best way to contact me. I will make every attempt to respond to your e-mail within 24-48 hours of receipt. When e-mailing me, be sure to email from your UTEP student account and please put the course number in the subject line. In the body of your e-mail, clearly state your question. At the end of your e-mail, be sure to put your first and last name, and your university identification number.
- **Announcements:** Check your university email for announcements course updates, deadlines, or other important messages.

NETIQUETTES

As we know, sometimes communication online can be challenging. It's possible to miscommunicate what we mean or to misunderstand what our classmates mean given the lack of body language and immediate feedback. Therefore, please keep these netiquette (network etiquette) guidelines in mind. Failure to observe them may result in disciplinary action.

- Always consider audience. This is a college-level course; therefore, all communication should reflect polite consideration of other's ideas.
- Respect and courtesy must be provided to classmates and to the instructor at all times. No harassment or inappropriate postings will be tolerated.
- When reacting to someone else's message, address the ideas, not the person. Post only what anyone would comfortably state in a face-to-face situation.

Blackboard, MS Teams, or Zoom is not a public internet venue; all postings to it should be considered private and confidential. Whatever is posted on in these online spaces is intended for classmates and professor only. Please do not copy documents and paste them to a publicly accessible website, blog, or other space.

COURSE PORTFOLIO

Students are required to prepare a course portfolio documenting all materials relevant to the course. The portfolio shall contain Power Point lecture notes, class notes, handouts, exams, homework assignments, study notes, and any relevant materials accumulated during the semester. The course portfolio can be in soft copy format. I strongly urge you to scan your graded homework assignment and class notes, and

keep them for your records. I believe that you will benefit from the portfolio years later when you need to review the learned subjects for advanced courses or professional engineer licensure exam.

STUDY GROUPS

Students should form study groups of about two to three persons. These groups will collaborate in the laboratory sessions. Group members are also encouraged to get together to solve the homework problems. Keep in mind that every student should submit the homework problems individually. The laboratory reports however submitted as a group effort.

ATTENDANCE

Students are expected to attend all online lecture sessions. Those who fail to attend classes regularly are inviting scholastic difficulty and, with the approval of the Dean of the College of Engineering, may be dropped from the course with a grade of F for repeated (4 or more) unexcused absences.

Homework assignments and other material will only be distributed electronically.

CALCULATORS AND CELL PHONES

To prepare you for the Fundamental of Engineering (FE) and Professional Engineering (PE) exams (<http://www.ncees.org/exams/calculators/>), only the following calculators are allowed during class, labs and exams:

- Hewlett Packard – HP 33S
- Casio – FX 115MS or FX 115MSPlus
- Texas Instruments – TI 30X IIS
- Texas Instruments – TI 36X SOLAR

It is your responsibility to get acquainted with the features of the calculator you decide to use. I recommend that you use this calculator for all your work (including other courses) since this will help you learn how to use all the features of your calculator.

The mere possession of a disallowed calculator, any cell phone or any other electronic item on or near you during tests is the ground for dismissing you from the exam with a grade of zero.

POLICY ON CHEATING

Students are expected to be above reproach in all scholastic activities. Students who engage in scholastic dishonesty are subject to disciplinary penalties, including the possibility of failure in the course and dismissal from the university. Scholastic dishonesty includes but is not limited to cheating, plagiarism, collusion, the submission for credit any work or materials that are attributable in whole or in part to another person, taking an examination for another person, any act designed to give unfair advantage to a student, or the attempt to commit such acts (Regents' Rules and Regulations, Part One, Chapter VI, Section 3, Subsection 3.2, Subdivision 3.22). Scholastic dishonesty harms the individual, all students, and the integrity of the university. Policies on scholastic dishonesty will be strictly enforced.

ACCOMODATIONS FOR STUDENTS WITH DISABILITY

If you have a disability and need classroom accommodations, please contact The Center for Accommodations and Support Services (CASS) at 747-5148, or by email to cass@utep.edu, or visit their office located in UTEP Union East, Room 106. For additional information, please visit the CASS website at <https://www.utep.edu/student-affairs/cass/>.

COURSE/INSTRUCTOR EVALUATION

An online course/instructor evaluation will be conducted near the end of the semester.

FINAL COMMENT

Good luck to all of you in this course. Please do not hesitate to ask questions in class, or if necessary, to see your professor outside of class. Any specific comments that students have on how the course might be improved are particularly welcomed, especially during the semester.