This course provides students with a working knowledge of the state-of-practice of foundation engineering, covering bearing capacity, settlement, and structural design of shallow foundations; lateral earth pressure; design of retaining and sheet-pile walls; and an introduction to deep foundations. The course is an elective for students in the civil engineering major and serves as an essential prerequisite for continued study in the areas of construction and structural engineering. The course is delivered in lecture format, and concentrates on practice-oriented analysis and design problems in foundation engineering.

**Prerequisite:** CE 335; Prerequisite or concurrent: CE 341

**Instructor:** Dr. Prasenjit Basu

213C Sackett Building  
Phone: 814-863-4010, Email: pbasu@engr.psu.edu; pxb42@psu.edu  
Office Hours: M W: 11:15 am – 12:30 PM; or through prior appointments


**Course Objectives:** The overall objective of this course is to make you acquainted with basic knowledge of foundations for different types of civil engineering structures. At the end of the semester you should be able to

- identify different stages involved in *Engineering and Design of Foundations*
- analyze data from different in situ (field) tests (e.g., SPT, CPT) for use in foundation engineering
- calculate and verify (with the tolerable limits) settlement expected for a shallow foundation bearing on sand or clay, and supporting vertical load
- calculate bearing capacity of a shallow foundation bearing on sand and on clay
- design a shallow foundation for a given structural load
- check the stability of different types of retaining walls
- calculate the capacity for a nondisplacement pile (drilled shaft)
- integrate your knowledge of *Engineering Soil Mechanics* and *Foundation Engineering* to engineer a foundation of a structure under simple loading conditions
Course Website: Course related materials (as required during the semester) will be posted on ANGEL (https://cms.psu.edu). You are expected to check it regularly.

If you are using the Communicate tab in ANGEL for course related e-mails, please check “Send a copy to each recipient's Internet e-mail” under ‘Message Options’.

Important: It is recommended that you configure “System Settings” to forward course emails to your primary email account as follows:
Step 1: Login into system
Step 2: Click “Preferences”
Step 3: Click “System Settings”
Step 4: Type your PSU Email under “Forwarding Address” and set “Forwarding Mode” as shown below.
Step 5: Click “Save”. You now should receive all course announcements in your primary email account as well as your ANGEL account.

Exams: Exam 1: October 21, 2013; during regular class hours
Exam 2: November 20, 2013; during regular class hours

NO Final Exam!

NO makeup exam will be arranged other than special circumstances. In case of any emergency, please inform me through e-mail. If no notification is made before the exam starts, there will NOT be any opportunity for makeup exam.

Homework: All homework will be due in the beginning of class on the date mentioned in those.

Late submissions will not be graded.

Neatly organize your homework solutions on Engineering Papers with each problem starting on a new page. Write only on the front side of the paper (the dark green grid should be on the back).
Quizzes: In-class quizzes will be given at the beginning or end of a class. Best 
\((n-1)\) out of \(n\) quiz grades will be considered for calculating the final 
grade. Quiz dates will be announced in advance. It is expected that a 
total of 5 – 6 (approximate number) quizzes will contribute to the final 
grade.

Reading Assignments: You are strongly encouraged to study the material covered in previous 
class(s) prior to joining the next class. This will help you enormously in 
several ways:

I. in clarifying your doubts before it gets too hazy;
II. in minimizing your HW solving time and preparation time for the 
exams;
III. in securing high grades in assignments and exams by minimizing 
errors.

Reading assignments (selected textbook sections and examples) will be 
assigned that are directly related to the material covered in class. You 
are expected to read those sections and clarify any doubts that you may 
have with your instructor.

Attendance: Attending all the classes is important and strongly recommended! 
Although no separate grade is allotted, attendance records may be used 
to improve you final grade in case of a border-line scenario. However, to 
have this privilege you should attend at least 90% of classes.

Grades: Best exam – 30%
Other exam – 25%
Homework – 20%
Quiz – 25%
Course Outline

The content of the course, as outlined below, may undergo minor changes (both in order and materials) during the semester. If time permits, some special topics (as mentioned below) may also be covered.

- Introduction to foundation engineering
  - Different types of foundations
  - Foundation design framework

- Subsurface exploration for foundation engineering (Chapter 2)
  - Soil boring and sampling
  - Standard penetration test (SPT)
  - Cone penetration test (CPT)
  - Other in situ tests

- Tolerable foundation movement (Chapter 5)

- Settlement analysis of shallow foundations (Chapter 5)
  - Foundation stress calculation
  - Settlement calculations in sand and clay

- Bearing capacity of shallow foundations (Chapter 3, 4)

- Design of shallow foundations

- Lateral earth pressure (Chapter 7)
  - At-rest, active and passive stress states
  - Earth pressure theories

- Retaining structures: types and purpose (Chapter 8, 9)
  - Gravity walls
  - Cantilever walls
  - Sheet-pile walls
  - Mechanically stabilized earth (MSE) walls

- Deep foundations (Chapter 11, 12)
  - Piles: Types; Installations
  - Drilled shafts

- Special topics (time permitting):
  - Braced cuts
  - Winkler foundation
  - Modulus of subgrade reaction
  - Plate load test
Academic Integrity:

This course will follow the University Faculty Senate Policy 49-20 on academic integrity. Definition and expectations: Academic integrity is the pursuit of scholarly activity in an open, honest and responsible manner. Academic integrity is a basic guiding principle for all academic activity at The Pennsylvania State University, and all members of the University community are expected to act in accordance with this principle. Consistent with this expectation, the University's Code of Conduct states that all students should act with personal integrity, respect other students' dignity, rights and property, and help create and maintain an environment in which all can succeed through the fruits of their efforts.

Academic integrity includes a commitment by all members of the University community not to engage in or tolerate acts of falsification, misrepresentation or deception. Such acts of dishonesty violate the fundamental ethical principles of the University community and compromise the worth of work completed by others.

To protect the rights and maintain the trust of honest students and support appropriate behavior, faculty and administrators should regularly communicate high standards of integrity and reinforce them by taking reasonable steps to anticipate and deter acts of dishonesty in all assignments (Senate Policy 44-40: Proctoring of Examinations). At the beginning of each course, it is the responsibility of the instructor to provide students with a statement clarifying the application of University and College academic integrity policies to that course.

For more information, please visit http://www.psu.edu/ufs/policies

Academic Adjustments:

Penn State welcomes students with disabilities into the University's educational programs. Every Penn State campus has an office for students with disabilities. The Office for Disability Services (ODS) Web site provides contact information for every Penn State campus: http://equity.psu.edu/ods/dcl. For further information, please visit the Office for Disability Services Web site: http://equity.psu.edu/ods.

In order to receive consideration for reasonable accommodations, you must contact the appropriate disability services office at the campus where you are officially enrolled, participate in an intake interview, and provide documentation: http://equity.psu.edu/ods/doc-guidelines. If the documentation supports your request for reasonable accommodations, your campus’s disability services office will provide you with an accommodation letter. Please share this letter with your instructors and discuss the accommodations with them as early in your courses as possible. You must follow this process for every semester that you request accommodations.

URL for statement: http://equity.psu.edu/ods/faculty-handbook/syllabus-statement