CE 643 – Advanced Foundation Engineering

Outline: Spring 2018

Course Description:

This course will describe methods of analysis, design and monitoring of earth retaining structures, including gravity and cantilever walls, as well as braced excavations and design and testing of deep foundations. Initially, the course will give an overview of site investigation methods and emphasize the importance of soil parameter selection in geotechnical problems. The lectures will also cover soil-structure interaction, slope stability, techniques for ground improvement and mechanically-supported earth walls and slopes. Throughout the course the students will also be exposed to the modeling and analysis of geotechnical problems using the Finite Element code Plaxis.

Class Schedule:

Mondays – 6pm-9pm
Classroom – FMH 313

Schedule:

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<th>Week</th>
<th>Topic</th>
<th>Assignments</th>
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| 1    | Introduction  
Soil classification  
Site investigation:  
- Drilling and soil sampling methods |           |
| 2    | Soil properties based on in-situ testing  
Geotechnical design:  
- Emphasis on the selection of soil parameters for ultimate and serviceability limit state calculations |           |
| 3    | Earth retaining structures - Introduction  
Earth pressures - Review |           |
| 4    | Gravity and cantilever retaining walls  
Propped walls  
Sheet-pile walls | Assignment 1 |
| 5    | Design of anchors and tiebacks  
Braced excavations | Term project: Outline and references  
Assignment 2 |
<p>| 6    | Braced excavations | Due Assignment 1 |</p>
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<th>Week</th>
<th>Topic</th>
<th>Assignment/Due Date</th>
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<td>7</td>
<td>Introduction to Finite Element modeling</td>
<td>Due Assignment 2</td>
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<td>Modeling of an excavation problem in Plaxis</td>
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<td>8</td>
<td>Midterm</td>
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<td>9</td>
<td>Soil-structure interaction</td>
<td>Term project: Due Initial draft Assignment 3 – Plaxis modeling</td>
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<td>Piles subject to horizontal loads</td>
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<td>10</td>
<td>Pile testing</td>
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<td>Slope stability</td>
<td>Assignment 4</td>
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<td>Due Assignment 3</td>
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<td>12</td>
<td>Drained and Undrained behavior of soils</td>
<td>Due Term project</td>
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<td>Modeling of a slope stability problem in Plaxis</td>
<td>Due Assignment 4</td>
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<td>13</td>
<td>Mechanically stabilized earth walls and slopes:</td>
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<td></td>
<td>- Reinforced soil</td>
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<td>- Nailed soil</td>
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<td>14</td>
<td>Ground improvement</td>
<td>Term project: Presentations</td>
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<td>15</td>
<td>Final</td>
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**Basis of Grading:**

20% - Assignments

20% - Term project (15% graded by instructor + 5% grade of team members)

20% - Midterm exam

30% - Final exam

10% - Class participation

Final grades are determined as follows:

A – Above 90%

B – 80 – 89%

C – 70 – 89%

D – 65 – 69%

F – Below 65%

**Term Project:**

The term project should be done in groups of three students; in special cases, two-student groups will be allowed. The project should involve a geotechnical topic covered in class, such as excavation walls, deep foundations, slopes stability. The students are expected to produce a final report with a maximum of 20 pages (not counting the figures), and present their project to the class in a 20-minute presentation, in the last class of the semester.

In Week 5, each group is required to submit a 1-page outline and brief explanation of the project they would like to do. They should also include a list of references/sources (not included in the 1-page outline) they are planning to use for the term project. An initial draft of the report is due in Week 9, in which feedback will be given to students, and the final report is due in Week 13. The students of each group will anonymously evaluate the other team-members in
Week 13, using a form provided by the instructor. This evaluation will count 5% of the final grade of the class.

Examples of term projects: “challenges in the design and construction of a deep excavation of a landmark project”, “forensic investigation of the failure of a slope”,... It can involve existing or future projects, particularly if the students are able to obtain geotechnical investigation data for a specific site).

Policies:
The class notes can be used in the mid-term and final exams. No other textbooks, notes, or internet can be used.

The NJIT Honor Code will be upheld and any violations will be brought to the immediate attention of the Dean of Students.

Students will be notified by the instructor of any deviations from the syllabus.

Students should bring the class notes posted on Moodle, calculator and writing paper to the class.

Work should be submitted in a professional manner.

Students should always keep a copy of their assignments.

Home assignments must be done on 8½”x11” engineering calculation paper.

No electronic versions of the home assignments will be accepted.

Home assignments are due at the beginning of the class indicated in the schedule above. Late submittals will incur a 50% grade deduction.

Laptops and cell phones should be switched off during quizzes and exams.

No recording devices shall be used during class or exams.