# Engineering School of Sustainable Infrastructure and Environment

# CEG 6116 – Advanced Shallow Foundation Design

3 Credits – Fall 2019

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**Description:** Techniques and steps to design shallow foundations: 1) identify types of limiting settlements, 2) identify and account for future influences on foundation stability, 3) methods to estimate foundation settlements, 4) methods to estimate foundation bearing capacity for various applied loads, 5) laboratory tests to determine soil stiffness and strength, and 6) structural foundation design based on internal shear and flexure.

**Lectures:** MWF – 9th Period (4:05 – 4:55 PM) – Weimer 1084

**Final Exam:** 12/9/2019 10:00 AM – 12:00 PM

**Instructor:** Dr. Scott Wasman
575I Weil Hall
(352) 273-4609
scott.wasman@essie.ufl.edu

**Text and Notes:** Notes for each lecture will be provided in PDF format and posted online. It is strongly recommended that the cited sections of the referenced texts be read prior to lecture.

Referenced texts:

*Foundation Analysis and Design*, Joseph E.Bowles, McGraw Hill, 1997.

*Geotechnical Engineering Circular No. 6-Shallow Foundations*, Robert E. Kimmerling, FHWA-SA-02-054, 2002.

*LRFD Design and Construction of Shallow Foundations for Highway Bridge Structures*, Samuel G. Paikowsky, et al., NCHRP Report 651, National Cooperative Highway Research Program, 2010.

**Assignments**: Homework will be assigned approximately weekly and due the following week.

**Grading:**

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|---|---|
| Exams – 2 | = 50% |
| Assignments | = 25% |
| Project | = 25% |

Final letter grades will be assigned based on the following scale.

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|---|---|
| A | 100-90% |
| B | 89-80% |
| C | 79-70% |
| D | 69-60% |
| E | 59-0% |

**Accommodations for Students with Disabilities:** Students requesting classroom accommodation must first register with the Dean of Students Office. That office will provide the student with documentation that he/she must provide to the instructor when requesting accommodation.

**Commitment to a safe and inclusive learning environment**

The Herbert Wertheim College of Engineering values broad diversity within our community and is committed to individual and group empowerment, inclusion, and the elimination of discrimination.

It is expected that every person in this class will treat one another with dignity and respect regardless of gender, sexuality, disability, age, socioeconomic status, ethnicity, race, and culture.

If you feel like your performance in class is being impacted by discrimination or harassment of any kind please contact your instructor or any of the following:

- Your academic advisor or Graduate Program Coordinator
- Robin Bielling, Director of Human Resources, 352-392-0903, rbielling@eng.ufl.edu
- Curtis Taylor, Associate Dean of Student Affairs, 352-392-2177, taylor@eng.ufl.edu
- Toshikazu Nishida, Associate Dean of Academic Affairs, 352-392-0943, nishida@ufl.edu

*Sexual Discrimination, Harassment, Assault, or Violence*

If you or a friend has been subjected to sexual discrimination, sexual harassment, sexual assault, or violence contact the **Office of Title IX Compliance**, located at Yon Hall Room 427, 1908 Stadium Road, (352) 273-1094, title-ix@ufl.edu

**Tentative Schedule:**

| Lecture # | Day | Month | Day | Description |
|---|---|---|---|---|
| 1 | W | Aug | 21 | Introduction |
| 2 | F | Aug | 23 | Causes of Settlements and Definition of Movements |
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| 3 | M | Aug | 26 | Limiting Movements and Damage |
| 4 | W | Aug | 28 | Stress Distributions |
| 5 | F | Aug | 30 | Stress Distributions |
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| - | M | Sept | 2 | Holiday |
| 6 | W | Sept | 4 | Calculation of Settlements |
| 7 | F | Sept | 6 | Elastic Theory |
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| 8 | M | Sept | 9 | Elastic Theory |
| 9 | W | Sept | 11 | Settlement from SPT |
| 10 | F | Sept | 13 | Lab |
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| 11 | M | Sept | 16 | Settlement from CPT |
| 12 | W | Sept | 18 | Settlement from CPT |
| 13 | F | Sept | 20 | Lab or Field |
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| 14 | M | Sept | 23 | Settlement based on FEA |
| 15 | W | Sept | 25 | Lab |
| 16 | F | Sept | 27 | Consolidation Test |
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| 17 | M | Sept | 30 | Time Rate of Consolidation (TRC) |
| 18 | W | Oct | 2 | Consolidation of NC and OC clay |
| - | F | Oct | 4 | No Class |
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| 19 | M | Oct | 7 | Terzaghi's Solution to TRC |
| 20 | W | Oct | 9 | Finite Difference Solution of TRC |
| 21 | F | Oct | 11 | Lab |
| | | | | |
| - | M | Oct | 14 | Exam #1 |
| 22 | W | Oct | 16 | Bearing Capacity (BC) |
| 23 | F | Oct | 18 | Prandtl and Rankine's Solution for BC |
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|---|---|---|---|---|
| 24 | M | Oct | 21 | Terzaghi's Solution for BC |
| 25 | W | Oct | 23 | General BC |
| 26 | F | Oct | 25 | Influence of Saturated Soil on BC |
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| 27 | M | Oct | 28 | Eccentric and Inclined Loading |
| 28 | W | Oct | 30 | Laboratory Determination of Soil Properties for BC (Direct Shear and Triaxial Shear Tests) |
| 29 | F | Nov | 1 | Insitu Methods for Soil Properties for BC |
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| 30 | M | Nov | 4 | BC of Footings on Sand and Clay |
| 31 | W | Nov | 6 | BC of Footings on Rock |
| 32 | F | Nov | 8 | Lab – Project Assignment |
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| - | M | Nov | 11 | No Class |
| 33 | W | Nov | 13 | Load and Resistance Factor Design-Shallow Foundations |
| - | F | Nov | 15 | Exam #2 |
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| 34 | M | Nov | 18 | Structural Design |
| 35 | W | Nov | 20 | Structural Design: Shear |
| 36 | F | Nov | 22 | Structural Design: Flexure |
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| 37 | M | Nov | 25 | Structural Design Examples |
| - | W | Nov | 27 | Holiday |
| - | F | Nov | 29 | Holiday |
| | | | | |
| 38 | M | Dec | 2 | Projects |
| 39 | W | Dec | 4 | Projects |