

## 1 Course Number and Name

- a. CENG 4341: Foundations and Retaining Wall Design, Fall 2021
- b. Lecture: Sec 010 11:00 am - 12:15 pm, Tuesday and Thursday

## 2 Credits and Contact Hours

- a. **Credits:** 3
- b. **Contact Hours:** 3 hours/week (Classroom)

## 3 Instructor Information

- a. **Course Coordinator:** William Kitch
- b. **Instructor:** William Kitch, 325-486-5501, [William.Kitch@angelo.edu](mailto:William.Kitch@angelo.edu),  
Office: VIN 268. For office hours see [faculty homepage](#).

## 4 Course Materials

### a. Required Textbooks:

- Coduto, D.P., Kitch, W.A. & Yeung, M.R. (2015) *Foundation Design: Principles and Practices*, 3<sup>rd</sup> Ed, Pearson, ISBN 978-0-13-341189-8 (Earlier editions are not acceptable)
- Coduto, Yeung & Kitch (2011): *Geotechnical Engineering: Principles and Practices*, 2<sup>nd</sup> Ed., Pearson, ISBN Hardcover (ISBN 9780132368681) or softcover (ISBN 9789332587427)
- Tanyyu, B. F., Sabatini, P. J., and Berg, R. R. (2008). *Earth Retaining Structures Reference Manual: NHI Course No. 132036*. FHWA. (Download available on Blackboard)
- Berg, R., Christopher, B., and Samtani, N. C. (2009). *Design of Mechanically Stabilized Earth Walls and Reinforced Soil Slopes – Volumes I & II*. Geotechnical Engineering Circular, FHWA. (Download available via RamCat)

### b. Reference Books

- 2018 International Building Code (available via web, link in Blackboard)
- ACI 318-19: Building Code Requirements for Structural Concrete and Commentary (available through library, see instructions in Blackboard®)

- c. Other supplemental materials posted on Blackboard® Learning Management System

## 5 Technology Requirements

This requires internet access and the ability to use the following online tools: Blackboard, Gradescope, Blackboard Collaborate, Adobe Acrobat (or another pdf maker), YouTube. No specific hardware is required, but access to a computer with webcam is highly encouraged.

## 6 Specific Course Information

- a. **Catalog Description:** Application of principles of classical soil mechanics and structural concrete design to the design and analysis of shallow foundations and retaining structures
- b. **Prerequisites:** Completed CENG 3341: Geotechnical Engineering, completed or enrolled in CENG 4362: Concrete Design
- c. **Required or Elective Course:** Elective

## 7 Specific Goals for the Course

- a. Course Learning Outcomes: When you complete this class, you should be able to:
  1. Design spread footings foundations for commercial or industrial buildings
  2. Design reinforced concrete cantilevered retaining walls
  3. Design mechanically stabilized earth retaining walls.
- b. Course Learning Outcome Mapping to ABET Criterion 3 Student Outcomes:

**Table 1: Course Learning Outcomes mapped to ABET Student Outcomes**

| <b>ABET Student Outcomes</b> | <b>1</b> | <b>2</b> | <b>3</b> |
|------------------------------|----------|----------|----------|
| 1. Solve Problems            | X        | X        | X        |
| 2. Design                    | X        | X        | X        |
| 3. Communication             | X        | X        | X        |
| 4. Ethics & Professionalism  |          |          |          |
| 5. Teamwork                  | X        | X        | X        |
| 6. Experimentation           |          |          |          |
| 7. Acquire New Knowledge     | X        | X        | X        |

## 8 Topics Covered

1. Probability and risk in foundation design
2. Failure modes and performance criteria
3. Site investigation and determination of soil parameters
4. Spread footing design, geotechnical and structural
5. Lateral earth pressures
6. Cantilevered retaining wall design
7. Mechanically stabilized earth retaining wall design

## **9 Course Delivery and Communications**

### **9.1 Delivery Method**

This is a face-to-face course with learning resources and supplemental materials posted in [Blackboard](#)<sup>1</sup>. Accommodations will be made for students who are in quarantine or isolation and are unable to attend.

This is an upper division design course. Class sessions will be a mix of lecture and in-class design exercises. Your design projects will be done in teams.

### **9.2 Communications**

You may communicate with me via Blackboard discussion board, email, phone, or via GroupMe text. See Figure 1 for QR code to join the course GroupMe

I will respond to email or telephone messages within 24 hours during working hours Monday through Friday. Weekend messages may not be returned until Monday.

Written communication via email: All private communication will be done exclusively through your ASU email address. Check frequently for announcements and policy changes. In your emails to faculty, include the course name and section number in your subject line.

Office hours or advising may be arranged with the assistance of Collaborate, Zoom, or another web meeting platform



**Figure 1: QR Code for class GroupMe**

## **10 Professionalism**

Professional engineering standards apply in this class. You are expected to demonstrate a behavior consistent with the conduct of an individual practicing in the engineering profession. You are expected to: (1) come prepared for class; (2) respect faculty and peers; (3) demonstrate responsibility and accountability for your own actions; (4) demonstrate sensitivity and appreciation for diverse cultures, backgrounds, and life experiences; (5) offer and accept constructive criticism in a productive manner; (6) demonstrate an attitude that fosters professional behavior among peers and faculty; (7) be punctual to class meetings; (8) maintain a good work ethic and integrity; and (9) recognize the classroom as a professional workplace.

## **11 Graded Material**

### **11.1 Class Attendance, Participation, Timeliness and Teamwork**

The number one complaint of engineering clients is the timeliness of deliverables (reports, drawings, specifications, etc.). As a professional engineer you will be expected to arrive at scheduled meetings on

time and prepared. Late proposals are not generally accepted. Late specifications or drawings may cost the engineer a monetary penalty. Professional engineering standards apply in this course.

You are expected to meet every class meeting on time and prepared. Attendance will be taken. Should you find it necessary to miss a class for any reason, you are expected to notify your instructor as early as the absence is known—preferably before the absence. It's important that you communicate clearly your instructors.

Your online assignments will be due at the time specified on Blackboard. Any assignments submitted in hard copy are due at the beginning of class on the due date. Your instructor may assess penalties for late work.

### 11.2 Pre-Class work and reading reviews

Nearly every class will have readings and other work you are expected to complete before class. There will be an online reading review due before nearly every class. The purpose of the reading reviews is to a) guide your pre-class preparation and b) give your instructor feedback on material needed to be covered in class. They will be graded on completeness and thoroughness of answers not on correctness.

### 11.3 Problem Sets

You will have computational project sets due every one or two weeks. These are designed to give your practice with the components of design you'll need for your projects. Problem sets are to be completed on engineering pad except where computer computations are appropriate. They must follow the department standard given/find/solution format.

### 11.4 Course Design Projects

There be three course design projects: footing design, cantilevered retaining wall design and MSE wall design. These projects will be done in teams.

### 11.5 Exams

This course will have two in-class exams and a final.

### 11.6 Grades: Weighting and Letter Grades

The weighting system shown in **Error! Reference source not found.** will be used in determining final grade for the course

**Table 2: Grade Weighting**

| Item           | Count | Pts each | Total Pts | Percent |
|----------------|-------|----------|-----------|---------|
| Reading Review | 25    | 3        | 75        | 9%      |
| Problem Sets   | 6     | 15       | 90        | 10%     |
| Projects       | 3     | 100      | 300       | 35%     |
| In-class exams | 2     | 100      | 200       | 23%     |
| Final Exam     | 1     | 200      | 200       | 23%     |
|                |       | Totals   | 865       | 100%    |

The instructor will determine letter grades for the course using his professional judgment, and the following standards as described in the University Catalog:

A = excellent work      B = good work      C = average work      D = poor work      F = failing work

### **11.7 Incomplete Grade Policy**

It is policy that incomplete grades be reserved for student illness or personal misfortune. Please contact faculty if you have serious illness or a personal misfortune that would keep you from completing course work. Documentation may be required. See ASU Operating Policy 10.11 [Grading Procedures](#)<sup>2</sup> for more information.

## **12 Classroom and University Policies and Student Support**

All students are required to follow the policies and procedures presented in the [Angelo State University Student Handbook](#)<sup>3</sup> and [Angelo State University Catalog](#)<sup>4</sup>.

### **12.1 Accommodations for Students with Disabilities**

ASU is committed to the principle that no qualified individual with a disability shall, on the basis of disability, be excluded from participation in or be denied the benefits of the services, programs or activities of the university, or be subjected to discrimination by the university, as provided by the Americans with Disabilities Act of 1990 (ADA), the Americans with Disabilities Act Amendments of 2008 (ADAAA) and subsequent legislation.

Student Disability Services is located in the Office of Student Affairs, and is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability. It is the student's responsibility to initiate such a request by contacting an employee of the Office of Student Affairs, in the Houston Harte University Center, Room 112, or contacting the department via email at [ADA@angelo.edu](mailto:ADA@angelo.edu). For more information about the application process and requirements, visit the [Student Disability Services website](#).<sup>5</sup> The employee charged with the responsibility of reviewing and authorizing accommodation requests is:

Dr. Dallas Swafford  
Director of Student Disability Services  
Office of Student Affairs  
325-942-2047  
[dallas.swafford@angelo.edu](mailto:dallas.swafford@angelo.edu)  
Houston Harte University Center, Room 112

### **12.2 Title IX at Angelo State University**

Angelo State University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from sex discrimination of any kind. In accordance with Title VII, Title IX, the Violence Against Women Act (VAWA), the Campus Sexual Violence Elimination Act (SaVE), and other federal and state laws, the University prohibits discrimination based on sex, which includes pregnancy, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination and unwelcome behavior of a sexual nature. The term includes sexual harassment, nonconsensual sexual contact, nonconsensual sexual intercourse, sexual assault, sexual exploitation, stalking, public indecency, interpersonal violence (domestic violence or dating violence), sexual violence, and any other misconduct based on sex.

You are encouraged to report any incidents involving sexual misconduct to the Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator, Michelle Miller, J.D. You may submit reports in the following manner:

Online: [Incident Reporting Form](#)<sup>6</sup>

Face to Face: Mayer Administration Building, Room 210

Phone: 325-942-2022

Email: [michelle.miller@angelo.edu](mailto:michelle.miller@angelo.edu)

Note, as a faculty member at Angelo State, I am a mandatory reporter and must report incidents involving sexual misconduct to the Title IX Coordinator. Should you wish to speak to someone in confidence about an issue, you may contact the University Counseling Center (325-942-2371), the 24-Hour Crisis Helpline (325-486-6345), or the University Health Clinic (325-942-2171).

For more information about resources related to sexual misconduct, Title IX, or Angelo State's policy please visit the [Title IX website](#).<sup>7</sup>

### **12.3 Student Absence for Observance of Religious Holy Days**

A student who intends to observe a religious holy day should make that intention known in writing to the instructor prior to the absence. See ASU Operating Policy 10.19 Student Absence for [Observance of Religious Holy Day](#)<sup>8</sup> for more information.

### **12.4 Information About COVID-19**

Please refer to ASU's [COVID-19 \(Coronavirus\) Updates](#)<sup>9</sup> web page for current information about campus guidelines and safety standards as they relate to the COVID-19 pandemic.

### **12.5 Student Conduct Policies**

#### **12.5.1 Academic Integrity**

Students are expected to maintain complete honesty and integrity in all work. Any student found guilty of any form of dishonesty in academic work is subject of disciplinary action and possible expulsion from ASU.

#### **12.5.2 Plagiarism**

Plagiarism is a serious topic covered in ASU's [Academic Integrity policy](#)<sup>10</sup> in the Student Handbook. Plagiarism is the action or practice of taking someone else's work, idea, etc., and passing it off as one's own. Plagiarism is literary theft.

In your discussions and/or your papers, it is unacceptable to copy word-for-word without quotation marks and the source of the quotation. It is expected that you will summarize or paraphrase ideas giving appropriate credit to the source both in the body of your paper and the reference list.

Papers are subject to be evaluated for originality via Turnitin or SafeAssign. Resources to help you understand this policy better are available at the [ASU Writing Center](#)<sup>11</sup>.

#### **12.5.3 Copyright Policy**

Students officially enrolled in this course should make only one printed copy of the given articles and/or chapters. You are expressly prohibited from distributing or reproducing any portion of course readings in printed or electronic form without written permission from the copyright holders or publishers.

### 13 Course Outline

The course outline is presented in **Table 3**. More detail and updates will be provided via Bb.

**Table 3: Course Lesson Outline**

| Lesson  | Date   | Topic  | Reading                             | Assignment Due |
|---|--------|--|-------------------------------------|----------------|
| <b>Module I: The foundation of foundation engineering</b> |        |  |                                     |                |
| 1   | Aug 24 | Introduction & probability                     | Ch. 1, § 2.1 – 2.2                  |                |
| 2   | Aug 26 | Reliability, risk and design                   | § 2.3 – 2.4                         |                |
| 3   | Aug 31 | Failure modes and performance requirements     | Ch. 5                               | PS #1          |
| 4   | Sep 2  | Site investigation                             | § 4.1 – 4.3                         |                |
| 5   | Sep 7  | Determining soil parameters, lab vs. field     | § 3.4, 3.5, 4.4 & 4.5               | PS #2          |
| 6   | Sep 9  | Lateral earth pressure introduction            | § 3.6                               | Prj #1.1       |
| <b>Module II: Geotechnical Footing Design</b>             |        |  |                                     |                |
| 7   | Sep 14 | Footing Types and Bearing Pressure             | Ch 6                                |                |
| 8   | Sep 16 | Bearing capacity part 1                        | § 7.1 & 7.2                         | Prj #1.2       |
| 9   | Sep 21 | Bearing capacity part 2                        | § 7.3 & 7.5                         | PS #3          |
| 10  | Sep 23 | Lateral capacity                               | § 7.9 & 7.10                        | Prj #1.3       |
| 11  | Sep 28 | Footing Settlement: e-log-p based methods      | § 8.3 – 8.6                         | PS #4          |
| 12  | Sep 30 | Footing Settlement: modulus-based methods      | § 8.1 – 8.2                         |                |
| 13  | Oct 5  | Geotechnical design synthesis                  | § 9.1 -9.6                          | PS #5          |
| <b>Module III: Structural Footing Design</b>              |        |  |                                     |                |
| 14  | Oct 7  | Basis of design                                | § 10.1 – 10.4                       |                |
| 15  | Oct 12 | Design for shear                               | § 10.5 through pg. 364              | Prj #1.4       |
| 16  | Oct 14 | Design for flexure                             | § 10.5                              |                |
|   | Oct 17 | Exam 1 online at home                          |                                     |                |
| 17  | Oct 19 | Project design review                          |                                     |                |
| 18  | Oct 21 | Rectangular, combined footings & connections   | § 10.7 – 10.10                      |                |
| <b>Module IV: Cantilevered Retaining Walls</b>            |        |  |                                     |                |
| 19  | Oct 26 | Earth Pressure: Coulomb theory Surcharge loads | FHWA § 3.2.1 - 3.2.5 & 3.7.1 -3.7.3 | PS #6          |
| 20  | Oct 28 | External wall stability                        | FHWA § 5.1 – 5.5                    | Prj #1 Final   |
| 21  | Nov 2  | Cantilevered retaining wall design part 1      | Handout                             |                |
| 22  | Nov 4  | Cantilevered retaining wall design part 2      | Handout                             | PS #7          |
|   | Nov 7  | Exam 2 online at home                          |                                     |                |
| 23  | Nov 9  | Drainage and detailing                         | Handout                             | Prj #2.1       |
| <b>Module V: Mechanically Stabilized Earth Walls</b>      |        |  |                                     |                |
| 24  | Nov 11 | Reinforced soil fundamentals                   | MSE Handout                         |                |
| 25  | Nov 16 | MSE Wall Design, part 1                        | MSE Handout                         | Prj #2 Final   |
| 26  | Nov 18 | MSE W all Design, part 2                       | MSE Handout                         |                |
| 27  | Nov 23 | MSE Wall Design, part 3                        | MSE Handout                         |                |
|   | Nov 25 | Thanksgiving Holiday                           |                                     |                |
| 28  | Nov 30 | Project work time                              |                                     |                |
| 29  | Dec 2  | Project work time                              |                                     |                |
|   | Dec 5  |  |                                     | Prj #3         |
|   | Dec 7  | Final exam 10:30 am - 12:30 pm                 |                                     |                |

## End Notes

---

<sup>1</sup> [angelo.blackboard.com](http://angelo.blackboard.com)

<sup>2</sup> <https://www.angelo.edu/content/files/14197-op-1011-grading-procedures>

<sup>3</sup> <http://www.angelo.edu/student-handbook/>

<sup>4</sup> <https://www.angelo.edu/academics/catalog/>

<sup>5</sup> <https://www.angelo.edu/current-students/disability-services/>

<sup>6</sup> <https://www.angelo.edu/incident-form>

<sup>7</sup> <https://www.angelo.edu/title-ix>

<sup>8</sup> <http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of>

<sup>9</sup> <https://www.angelo.edu/covid-19/>

<sup>10</sup> <http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php>

<sup>11</sup> [http://www.angelo.edu/dept/writing\\_center/academic\\_honesty.php](http://www.angelo.edu/dept/writing_center/academic_honesty.php)