CENG 4362: Concrete Design

1: Course Logistics
- Semester: Fall 2018
- Section: 010
- Class Days: Tuesday and Thursday
- Class Time: 2:00pm – 3:15pm

2: Instructor Information
- Instructor: Anthony Battistini, PhD
- Email: anthony.battistini@angelo.edu
- Phone: (325) 486-5511
- Office: Vincent 271
- Office Hours: Posted on Dr. Battistini’s ASU Faculty Website

3: Course Materials

3.1: Required Textbook
None

3.2: Recommended Textbooks
The textbooks listed below are recommended only. The notes provided in class may be sufficient to learn the required material; however, if you plan to become a structural engineer or if you learn well by studying a textbook and working extra problems, these resources could be beneficial to you. For your convenience, my class notes will reference chapters/sections in the textbook and edition authored by Darwin, Dolan and Nilson below, as well as the ACI 318-14 Building Code.

American Concrete Institute, “ACI 318-14: Building Code Requirements for Structural Concrete”, 2014, ISBN: 9780870319303. ($99 as ACI Student Member)


It is also recommended that you purchase a binder to organize your notes for the class. The class primarily uses handouts, which are posted to Blackboard and need to be printed and brought class.

3.3: Software
The use of structural analysis software will be necessary to complete the course project. The following programs are recommended, but the use of any other suitable commercial software is permitted.

MASTAN2 v3.3, Ziemian, Ronald and William McGuire- available for free download at the MASTAN2 Website.

3.4: Other Supplemental Materials

Materials Posted on Blackboard® Learning Management System.

It is also recommended that you purchase a binder to organize your notes for the class. The class primarily uses handouts, which are posted to Blackboard and need to be printed and brought to class.

4: Prerequisites

- CENG 3361 Structural Analysis I
- CENG majors only or departmental permission

5: Course Description

Catalog: Analysis and design of beams, one-way slabs and columns. Mechanics, behavior and design of reinforced concrete members subject to axial loads, bending and shear with ACI specifications.

6: Student Learning Outcomes

When you complete this course, you should be able to:

1. Describe load and resistance factor design (LRFD) and allowable stress design (ASD) and apply LRFD to design safe structures
2. Analyze and design a simply supported beam for flexure and shear
3. Analyze and design continuous beams for flexure and shear
4. Analyze and design columns subjected to axial load and bending moment
5. Use LRFD to design serviceable and strong beams and columns in a low-rise concrete building for specified loads in a team setting

7: Course Outcome Mapping

The mapping of the Student Learning Outcomes for the course to the ABET Criterion 3 Student Outcomes is shown in Table 1.

Table 1: Student Learning Outcome Mapping to ABET Criterion 3

<table>
<thead>
<tr>
<th>Course Learning Outcome</th>
<th>1 Solve Problems</th>
<th>2 Design</th>
<th>3 Communication</th>
<th>4 Ethics &amp; Professionalism</th>
<th>5 Teamwork</th>
<th>6 Experimentation</th>
<th>7 Acquire Knowledge</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
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<td></td>
</tr>
<tr>
<td>2</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
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<td>X</td>
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<td>X</td>
<td></td>
</tr>
</tbody>
</table>

8: Course Structure, Communication, Policies

The course will meet twice a week for class, where the instructor will be communicating new engineering theories and information to the students. You are expected to complete any assignments prior to class so that you are prepared to ask questions, to solve problems, and to learn new material during class.

Lesson materials will be organized on the Blackboard website for the course. You are expected to have access to the lesson handouts during class by either printing the handouts or having them available for
modification on your computer/tablet. The handouts only outline the material for a given class and will need to be completed during class for the student to have the relevant information.

Attendance at lectures is required. Some of the material presented will correlate with the textbook, but other material will not and/or may be presented differently. You are responsible for all topics that are covered in class.

Important course announcements and changes will be sent by email via Blackboard. Students are expected to regularly check their Angelo State University email for these messages.

Academic integrity is expected from all students at all times in accordance with Part I, Section B.15 of the Angelo State University Code of Student Conduct.

Respect for your fellow classmates is required. Do not act in a manner that may distract others, including but not limited to: talking during lecture, texting, receiving obnoxious phone calls, watching YouTube videos, eating noisily, listening to loud music, walking to the front of the room during lecture just to turn your homework in because you were late to class, etc... If you need to do any of these activities, you are free to leave the classroom.

9: Professionalism

Professional engineering standard 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.

10: Graded Material

10.1: Final Grades

<table>
<thead>
<tr>
<th>Component</th>
<th>Weight</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework/Participation/ICAs:</td>
<td>20%</td>
</tr>
<tr>
<td>Exam I:</td>
<td>20%</td>
</tr>
<tr>
<td>Exam II:</td>
<td>20%</td>
</tr>
<tr>
<td>Semester Project:</td>
<td>40%</td>
</tr>
</tbody>
</table>

All grades will be assigned on an absolute scale as a minimum. The instructor reserves the right to adjust the weights given to the assignments/homework/exams listed above. Any adjustments will be applied evenly to the entire class and never to the detriment of your grade.

10.2: Grading Scale

<table>
<thead>
<tr>
<th>Percentage Range</th>
<th>Grade</th>
</tr>
</thead>
<tbody>
<tr>
<td>90.0% - 100%</td>
<td>A</td>
</tr>
<tr>
<td>80.0% - 89.9%</td>
<td>B</td>
</tr>
<tr>
<td>70.0% - 79.9%</td>
<td>C</td>
</tr>
<tr>
<td>60.0% - 69.9%</td>
<td>D</td>
</tr>
<tr>
<td>&lt; 60.0%</td>
<td>F</td>
</tr>
</tbody>
</table>
10.3: **Class Attendance, Participation, Timeliness, and Teamwork**

- A portion of your grade will be based on class participation. For full credit, students are expected to arrive to class on time and adequately prepared, meaning that any assigned readings and/or homework are already completed by the time the class period begins.
- Participation and In-class assignment (ICA) points will be assigned at the discretion of the instructor, and may be based upon the following:
  - Attendance throughout the class period
  - Completion of homework or reading assignments
  - Willingness to answer a question when called upon (answer does not have to be correct)
  - Effort displayed during group activities or in-class assignments
- Students may work together on in-class assignments, but may have to turn in his or her own problem work.
- If you will be absent, please make prior arrangements with the instructor. Make-up participation or in-class assignments will not be given.

10.4: **Homework**

- Homework is due to the instructor by 2:00pm on the day specified by the instructor.
- Late homework may not be accepted for full credit, unless previous arrangements with the instructor are made. The instructor recognizes that occasionally, other obligations may prevent you from completing a particular assignment on time, so please discuss with the instructor prior to the due date to make arrangements to complete and turn in the assignment.
- Late homework is subject to additional deductions at the discretion of the instructor.
- Neatness counts! As an engineer and a professional, your work will often be read and scrutinized by others. In some instances, it could be a legal document or a piece of evidence in a court of law. It is your responsibility that the work you prepare is presented in a legible, methodical, and logical manner.
- Any handwritten homework should be performed directly on the printout of the homework or on one side of 8.5” x 11” engineering computation paper, either the “green” paper or a black and white copy of it (available on Blackboard).
- Each problem should be performed on a separate page.
- The solution should include: the problem statement, solution steps, and answer. Key intermediate values should be indicated by underlining or some other means, and the final answer should be boxed/circled.
- Units should be included with all answers.
- Sketches/diagrams should be made with a straight edge and are generally necessary to be included with the problems solved within this course.
- Name, date, and problem info should be included on each page. See the example homework solution posted to Blackboard, which meets all of these requirements.
- Students may collaborate to complete the homework; however, each student must turn in his/her own assignment for grading. Direct copying of other’s work is not allowed and may be subject to disciplinary actions.
- Each homework problem will be assigned a particular value depending on the perceived difficulty and work required to solve it.
- Due to the length of solving problems, it is possible students may only have the opportunity to solve one of each type of problem on the assigned homework. Therefore, it is imperative that each student attempt to solve each homework problem as it may be the only practice you will have to reinforce (sorry for the pun!) the learned material.
• To facilitate the return of graded homework, a folder containing all graded papers will be passed from student to student at the beginning of class. While the grade will not appear on the front page, it is possible that other students could view your grade for the homework. In accordance with the Family Educational Rights and Privacy Act of 1974 (FERPA), students must consent to disclose these educational records. If you do not consent, please notify me by email and I will separate your homework from the others and return it individually. Otherwise, it is assumed that you consent to this mechanism of return. Graded exams and/or lab reports will be returned individually.

10.5: Exams
• Make-up exams will only be given for extenuating circumstances, unless prior arrangements with the instructor are agreed upon. Proof, such as a doctor’s note or other official document, may be required for unexcused absences during an exam.
• Exams will be open textbook or notes. Details will be discussed closer to the exam time.
• Exams I and II will be 1.25 hours long and will be given during the class periods indicated on the course schedule.
• The scheduled final exam period will be used for your semester project presentations. The scheduled final exam period for this course, according to the Angelo State University Final Exam Schedule, is Tuesday, December 11, 2018 from 1:00pm-3:00pm.

11: Classroom and University Policies and Student Support

11.1: General Policies
All students are required to follow the policies and procedures presented in the Angelo State University Student Handbook and Angelo State University Catalog.

11.2: Student Disability Services
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.

The Office of Student Affairs is the designated campus department charged with the responsibility of reviewing and authorizing requests for reasonable accommodations based on a disability, and it is the student’s responsibility to initiate such a request by contacting Ms. Dallas Swafford, Director of Student Disability Services, at 325-942-2047 or Dallas.Swafford@angelo.edu, or visit the Student Disabilities Services Website.

11.3: Title IX Statement
Angelo State University is committed to the safety and security of all students. If you or someone you know experience sexual harassment, sexual assault, domestic or dating violence, stalking, or discrimination, you may contact ASU’s Title IX Coordinator: Ms. Michelle Boone, Director of Title IX Compliance, at 325-486-6357, or Michelle.Boone@angelo.edu.

11.4: Observance of Religious Holy Day
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 for more information.
11.5: 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\textsuperscript{11} for more information.

11.6: Student Conduct Policies
11.6.1: 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.

The College of Science and Engineering adheres to the Statement of Academic Integrity\textsuperscript{10,13}

11.6.2: Plagiarism
Plagiarism is a serious topic covered in ASU’s Academic Integrity Policy\textsuperscript{12} 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. Resources to help you understand this policy better are available at the ASU Writing Center\textsuperscript{13}.

11.6.3: 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.

12: Course Specific Information
12.1: Photo/Video Policy
- Lectures, classroom activities, and laboratory experiments throughout the course may be photographed/filmed by the instructor for educational purposes pertaining to research and scholarship. Personally identifying information will not be used. An informed consent form and copyright release form will be forthcoming, if necessary.
- Some pictures/videos may be included on social media by the DLHE department and/or professor. In general, students will be informed prior to public posting of this content.
- Students are allowed to take photos/videos of lectures and classroom activities provided the following conditions are met:
  - The capturing of the photo/video is not disruptive to other students or the professor.
  - The photos/videos are for personal use only (not posted publicly), unless otherwise discussed.
  - Fun photos/videos are shared with the professor 😊
13: Instructor Prerogative

The instructor reserves the right to change the policies and procedures of this course when he deems it necessary. Any such changes will be implemented fairly and will typically not be a detriment to your grade. The instructor will notify you of any such changes in a timely manner.

13.1: Diversity and Equity Statement

The instructor strives to promote a living and learning environment for outstanding growth and productivity among all students, faculty and staff. Diversity is broadly defined to include such characteristics as, but not limited to, race, ethnicity, gender, religion, age, disability, sexual orientation, or socio-economic background. Diversity also entails different viewpoints, philosophies, and perspectives. Course activities and attention to these aspects of diversity will help promote a culture of inclusion and belonging, and an environment where diverse opinions, backgrounds and practices have the opportunity to be voiced, heard and respected. All students in my classroom are expected to show respect for one another.
14: Course Outline

The course outline is presented in Table 2. Detailed reading and homework assignments along with updates to this schedule will be provided via Blackboard.

**Table 2: Course Outline**

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Day</th>
<th>Date</th>
<th>Darwin et al Textbook</th>
<th>Notes/Topic</th>
<th>Assignment Due</th>
</tr>
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<tbody>
<tr>
<td>01</td>
<td>Tuesday</td>
<td>8/28</td>
<td>Syllabus, Course Discussion, Concrete Structures Exploration</td>
<td></td>
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</tr>
<tr>
<td>02</td>
<td>Thursday</td>
<td>8/30</td>
<td>2.1-2.7</td>
<td>Material Properties I: Basics; Stress vs Strain</td>
<td>Project 01</td>
</tr>
<tr>
<td>03</td>
<td>Tuesday</td>
<td>9/4</td>
<td>2.1-2.7; 3.5</td>
<td>Material Properties II: Tension; Reinforcement; Transformed Area</td>
<td></td>
</tr>
<tr>
<td>04</td>
<td>Thursday</td>
<td>9/6</td>
<td>1.3-1.7</td>
<td>Design Methodology I: LRFD; ASD; f-factors</td>
<td></td>
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<tr>
<td>05</td>
<td>Tuesday</td>
<td>9/11</td>
<td>1.8</td>
<td>Design Methodology II: Load Path</td>
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</tr>
<tr>
<td>06</td>
<td>Thursday</td>
<td>9/13</td>
<td>3.6; 4.2ab</td>
<td>Flexure I: Uncracked and Cracked Transformed Sections</td>
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<tr>
<td>07</td>
<td>Tuesday</td>
<td>9/18</td>
<td>4.2c</td>
<td>Flexure II: M_s, Whitney Stress Block</td>
<td>Homework 03</td>
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<tr>
<td>08</td>
<td>Thursday</td>
<td>9/20</td>
<td>4.3cdefg</td>
<td>Flexure III: Tension-Controlled Sections</td>
<td></td>
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<tr>
<td>09</td>
<td>Tuesday</td>
<td>9/25</td>
<td>4.6</td>
<td>Flexure IV: Compression-Controlled Sections</td>
<td>Project 02; Homework 04</td>
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<tr>
<td>10</td>
<td>Thursday</td>
<td>9/27</td>
<td>4.3-4.5</td>
<td>Flexure V: Design for Flexure</td>
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<td>11</td>
<td>Tuesday</td>
<td>10/2</td>
<td>12.1-12.3</td>
<td>Flexure VI: Analysis and Design of One-Way Slabs</td>
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<tr>
<td>12</td>
<td>Thursday</td>
<td>10/4</td>
<td>4.7</td>
<td>Flexure VII: Analysis and Design of T-Beams</td>
<td>Project 03</td>
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<tr>
<td>13</td>
<td>Tuesday</td>
<td>10/9</td>
<td>4.6</td>
<td>Flexure VIII: Analysis of Doubly Reinforced Sections</td>
<td>Homework 06</td>
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<td>14</td>
<td>Thursday</td>
<td>10/11</td>
<td>Flexure IX: Design of Doubly Reinforced Sections; Other ACI Requirements</td>
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<td>15</td>
<td>Tuesday</td>
<td>10/16</td>
<td>5.1-5.3a</td>
<td>Shear I: Shear and Diagonal Tension</td>
<td>Homework 07</td>
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<tr>
<td>16</td>
<td>Thursday</td>
<td>10/18</td>
<td>Shear II: V_s and V_c</td>
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<tr>
<td>17</td>
<td>Tuesday</td>
<td>10/23</td>
<td>5.3-5.4</td>
<td>EXAM I</td>
<td></td>
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<tr>
<td>18</td>
<td>Thursday</td>
<td>10/25</td>
<td>5.5</td>
<td>Shear III: Analysis and Design for Shear</td>
<td>Homework 08</td>
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<tr>
<td>19</td>
<td>Tuesday</td>
<td>10/30</td>
<td>5.5</td>
<td>Shear IV: Design for Shear</td>
<td>Project 04, 05</td>
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<td>20</td>
<td>Thursday</td>
<td>11/1</td>
<td>7.1-7.3</td>
<td>Serviceability I: Crack Widths</td>
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<tr>
<td>21</td>
<td>Thursday</td>
<td>11/6</td>
<td>7.4-7.7</td>
<td>Serviceability II: Deflections</td>
<td></td>
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<tr>
<td>22</td>
<td>Tuesday</td>
<td>11/13</td>
<td>6.1-6.3</td>
<td>Detailing I: Development Length</td>
<td></td>
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<tr>
<td>23</td>
<td>Thursday</td>
<td>11/15</td>
<td>6.10, Ch.18</td>
<td>Detailing II: Economy, Detailing Joints</td>
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<tr>
<td>24</td>
<td>Tuesday</td>
<td>11/27</td>
<td>9.9-9.11</td>
<td>Columns III: Confinement; Spirals vs Rectangular Ties</td>
<td>Project 07; Homework 12</td>
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<tr>
<td>25</td>
<td>Thursday</td>
<td>11/29</td>
<td>EXAM II</td>
<td></td>
<td></td>
</tr>
<tr>
<td>26</td>
<td>Tuesday</td>
<td>12/4</td>
<td>Ch.18, Ch.22</td>
<td>Additional Considerations: Slender Columns; Prestressed vs Post-Tensioned Concrete</td>
<td></td>
</tr>
<tr>
<td>27</td>
<td>Thursday</td>
<td>12/6</td>
<td></td>
<td>Semester Project Meetings</td>
<td></td>
</tr>
<tr>
<td>28</td>
<td>Tuesday</td>
<td>12/11</td>
<td>SEMESTER PROJECT REPORT AND PRESENTATIONS, 1:00pm-3:00pm</td>
<td>Project 08, 09, 10</td>
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<tr>
<td>29</td>
<td>Thursday</td>
<td>12/13</td>
<td></td>
<td>No Class- Project Evaluations are Due</td>
<td>Project 11</td>
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15: End Notes: Complete Hyperlinks From Syllabus

1 http://www.angelo.edu/content/profiles/6463-anthony-d-battistini
2 http://www.mastan2.com/download.html
3 http://edu.iesweb.com/
4 https://blackboard.angelo.edu/
6 https://www.angelo.edu/services/registrars_office/final.php
7 http://www.angelo.edu/student-handbook/
8 http://www.angelo.edu/catalogs/
9 http://www.angelo.edu/services/disability-services/
10 http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of
11 http://www.angelo.edu/content/files/14197-op-1011-grading-procedures
12 http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php
13 http://www.angelo.edu/dept/writing_center/academic_honesty.php