

1: Course Number and Name

- a. **CENG 4362:** Concrete Design, Fall 2021
- b. Lecture: Section 010, TR 2:00pm – 3:15pm, VIN 158

2: Credits and Contact Hours

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

3: Instructor Information

- a. **Course Coordinator:** Anthony Battistini
- b. **Instructors:**
 - i. Anthony Battistini, 325-486-5511, anthony.battistini@angelo.edu. Office: VIN 271. For office hours see [faculty homepage](#)¹.

4: Required Course Materials

- a. **Required Textbook:** American Concrete Institute, “ACI 318-19: Building Code Requirements for Structural Concrete and Commentary”, 2019, ISBN: 9781641950565. (Free- available through ASU Library- see Instructions under ACI 318-19 tab on Blackboard).
- b. **Recommended Textbooks:**
 - i. Darwin, D., Dolan, C.W., and Nilson, A.H., Design of Concrete Structures. 15th ed., McGraw Hill, 2016, ISBN: 978-0-07-339794-8.
 - ii. MacGregor, James and James Wight, Reinforced Concrete: Mechanics and Design. 6th ed., Prentice Hall, 2012, ISBN: 978-0-13-217652-1.
- c. **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.

- i. MASTAN2 v3.5, Ziemian, Ronald and William McGuire- available for free download at the [MASTAN2 Website](#)².
- ii. VisualAnalysis v18.0, Integrated Engineering Software, IES- available for free download at the [Visual Analysis Website](#)³.

In addition, the following will be needed to complete homework problems and project submissions.

- iii. Microsoft Word, Excel, PowerPoint or similar.
- iv. AutoDesk Revit, ACAD

- d. **Other Supplemental Materials:** Materials posted on Blackboard® Learning Management System

5: Technology Requirements

To successfully complete this course, you need to access to the Blackboard® Learning Management System. Homework will be submitted and subsequently graded online through Blackboard.

You may also have to watch some lessons using posted videos and to submit .pdf scans or copies of your notes/in-class assignments. More details will follow, if necessary.

Laptops and tablets may be used in-class and on exams; however, calculation work may be necessary for inclusion on exams.

Lastly, the course will use Flipgrid. An app is available for your smartphone, or it can be accessed via the Internet. To upload videos, you will need a speaker and webcam (your phone can likely do this).

6: Specific Course Information

- a. **Catalog Description:** 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.
- b. **Prerequisites:** CENG 3361 Structural Analysis I; CENG majors only or Departmental permission
- c. **Required or elective:** Elective for the BSCE Major (satisfies Design Elective)

7: Specific Goals for the Course

- a. Course Learning Outcomes:
 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
- b. Course Learning Outcome Mapping to ABET Criterion 3 Student Outcomes:

Table 1: Course Learning Outcomes mapped to ABET Student Outcomes

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

8: Topics Covered

1. Material Properties- Concrete and Steel Rebar with Engineering Mechanics Review
2. Design Methodology
3. Load Path
4. Flexure- M_{cr} , M_n , Whitney Stress Block, tension-controlled sections, transition- and compression-controlled sections, design
5. Flexure- Analysis and Design of One-Way Slabs, T beams, Doubly Reinforced Sections
6. Shear- Analysis and Design using ACI 318-19
7. Detailing- Anchorage, Development Length, Splices (time permitting)
8. Columns- P-M Interaction Diagrams, Analysis and Design using ACI 318-19
9. Serviceability (time permitting)

9: Course Delivery and Communications

9.1: Delivery Methods

The course will meet face-to-face, two times 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. Accommodations will be made for students who are in quarantine or isolation and are unable to attend.

Lesson materials will be organized on the [Blackboard](#)⁴ website for the course. Students should 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 we will complete them together during class so you have the relevant information.

Attendance in class is expected. 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. Please communicate to the instructor if you need to miss class so a suitable arrangement can be made.

Academic integrity is expected from all students at all times in accordance with [Part I, Section B.1](#)⁵ 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.

9.2: Communications

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.

Students should feel free to contact the instructor regarding any issues with the class.

In-person and virtual office hours are available for students to directly meet with the instructor. Dr. Batts' office hours can be found on his [faculty website](#)⁶.

Students can also email Dr. Batts with any questions and concerns. Dr. Batts will usually respond to email within a few hours, but definitely within 24 hours Monday through Friday. Weekend replies may take longer.

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: Final Grades

Table 2: Grade Weighting

<u>Item</u>	<u>Percent</u>
Participation/In-Class Assignments:	10%
Laboratory Assignments	15%
Homework	15%
Exam I	20%
Exam II	20%
Final Exam	20%
Total	100%

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.

11.2: Grading Scale

90.0% - 100%	A
80.0% - 89.9%	B
70.0% - 79.9%	C
60.0% - 69.9%	D
< 60.0%	F

11.3: Class Attendance, Participation, Timeliness and Teamwork

- A portion of your grade will be based on 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 points will be assigned at the discretion of the instructor, and may be based upon the following:
 - Attendance throughout the class period (sometimes recorded by photograph)
 - 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
- In-class assignments may be given periodically to help identify student understanding of the material.
- 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.

11.4: Homework

- Homework is due on Blackboard by 2:00pm on the day specified on the course schedule, unless otherwise listed in Blackboard.

- 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. Please talk to me!!
- Late homework is subject to additional deductions at the discretion of the instructor. In general, it is more beneficial to turn in late homework that you have tried to complete than it is to turn in “junk” on time.
- 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, 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), or on plain white paper.
- Each problem should start 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.
- 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 the learned material.
- **All homework must be accompanied by a brief commentary.** The purpose of the commentary is to reflect on the work performed in each problem. You may include any thoughts about the problem, any difficulties you had, any surprises about the answers, how you might apply the problem to real-world structures, etc... The commentary should be brief (only 2-4 sentences per problem) but thought-provoking and true. The commentary will be graded as part of each problem and will be submitted on Flipgrid.

11.5: Exams

- Make-up exams will only be given for extenuating circumstances, unless prior arrangements with the instructor are agreed upon.
- Exams will not be open textbook or notes, but the use of a formula/cheat sheet will be permitted. 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 as a weather backup for your semester project presentations. The scheduled final exam period for this course, according to the university's standard schedule ([Angelo State University Final Exam Schedule](#)⁷) on Tuesday, December 7, 2021 from 1:00pm-3:00pm.

12: Classroom and University Policies and Student Support

12.1: General Policies

All students are required to follow the policies and procedures presented in the [Angelo State University Student Handbook](#)⁸ and [Angelo State University Catalog](#)⁹.

12.2: 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.

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. For more information about the application process and requirements, visit the [Student Disability Services website](#)¹⁰. 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
Houston Harte University Center, Room 112

12.3: 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 of sexual misconduct directly 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](#)¹¹

Face to Face: Mayer Administration Building, Room 210

Phone: 325-942-2022

Email: 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 [ASU's Title IX Website](#)¹².

12.4: 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](#)¹³ for more information.

12.5: 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](#)¹⁴ for more information.

12.6: Information About COVID-19

Please refer to ASU's [COVID-19 \(Coronavirus Updates\)](#)¹⁵ webpage for current information about campus guidelines and safety standards as they relate to the COVID-19 pandemic.

12.7: Student Conduct Policies

12.7.1: 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.

12.7.2: Plagiarism

Plagiarism is a serious topic covered in ASU's [Academic Integrity policy](#)¹⁶ 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](#)¹⁷.

12.7.3: 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: Instructor Specific Information

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: Photo/Video Policy

- 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 😊

13.2: 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 3. Updates to this schedule will be provided via Blackboard.

Table 3: Course Lesson Outline

Lesson	Day	Date	Darwin et al Textbook	Notes/Topic	Assignment Due
01	Tuesday	8/24		Syllabus, Course Discussion, Project Introduction, Concrete, Concrete Structures Exploration	
02	Thursday	8/26	2.1-2.7	Material Properties I: Basics; Stress vs Strain	Homework 01
02V	Friday	8/24		Material Props II: Kinematics, Transformed Area (In-Class Assignment)	
03	Tuesday	8/31	2.1-2.7; 3.5	Material Properties III: Examples (In-Class Assignment)	ICA 02V
04	Thursday	9/2	1.3-1.7	Design Methodology: LRFD; ASD; ϕ -factors	ICA 03; Homework 02
	Friday	9/3		PROJECT PROPOSAL DUE	Project 01
05	Tuesday	9/7	1.8	Load Path: Calculating P_u , V_u , M_u (In-Class Assignment)	
06	Thursday	9/9	3.6; 4.2ab	Flexure I: Uncracked and Cracked Transformed Sections	ICA 05; Homework 03
	Friday	9/10		PROJECT MEETING 1 COMPLETE	Project 02
07	Tuesday	9/14	4.2c	Flexure II: M_n , Whitney Stress Block	
08	Thursday	9/16	4.3cdefg	Flexure III: Tension-Controlled Sections (In-Class Assignment)	Homework 04
	Friday	9/17		PROJECT LAYOUT AND PRELIMINARY DESIGN DUE	Project 03
09	Tuesday	9/21	4.6	Flexure IV: Compression-Controlled Sections (In-Class Assignment)	ICA 08
10	Thursday	9/23	4.3-4.5	Flexure V: Finish ICA 09, Design for Flexure	Homework 05
11	Tuesday	9/28	4.3-4.5	Flexure VI: Design Example	ICA 09
11A	Thursday	9/30	4.3-4.5	Flexure VI (continued): Design Example	
	Tuesday	10/5		EXAM I	
12	Thursday	10/7	12.1-12.3	Flexure VII: Analysis and Design of One-Way Slabs	
13	Tuesday	10/12	4.7	Flexure VIII: Analysis and Design of T-Beams	
14	Thursday	10/14	4.6	Flexure IX: Analysis of Doubly Reinforced Sections	
	Friday	10/15		FLEXURAL DESIGN OF BEAMS/SLABS DUE	Project 04
15	Tuesday	10/19	4.6	Flexure X: Design of Doubly Reinforced Sections; Approximate M_n	
16	Thursday	10/21	5.1-5.3a	Shear I: Shear and Diagonal Tension (In-Class Assignment)	
	Friday	10/22		PROJECT MEETING 2 COMPLETE	Project 05
17	Tuesday	10/26	5.3-5.4	Shear II: V_c and V_s	ICA 16
18	Thursday	10/28	5.5	Shear III: Design for Shear	
19	Tuesday	11/2		CATCH-UP DAY	
19, 20	Thursday	11/4	6.1-6.3; 6.10, Ch.18	Detailing I & II: Anchorage, Development Length, Hooks, Joints, Splices, Economy	
	Friday	11/5		DESIGN OF BEAMS FOR SHEAR DUE	Project 06

Lesson	Day	Date	Darwin et al Textbook	Notes/Topic	Assignment Due
	Tuesday	11/9		Detailing II Wrap-Up; Exam II Questions; Design Project Time	Homework 06
21	Thursday	11/11	9.1-9.2	Columns I: PNA	ICA 20
	Friday	11/12		FINAL BEAM/SLAB DRAWINGS WITH BAR CUT-OFFS DUE	Project 07
22	Tuesday	11/16	9.3-9.5	Columns II: P-M Interaction Diagrams	
23	Thursday	11/18	9.9-9.11	Columns III: ACI Column Requirements; Confinement; Spirals vs Rectangular Ties	
24	Tuesday	11/23		Columns IV: Column Design	Homework 07
	Thursday	11/25		NO CLASS- THANKSGIVING	
25	Tuesday	11/30	7.1-7.7; Ch.18; Ch.22	Serviceability- Crack Widths and Deflections; Additional Considerations for Slender Columns; Design Project Time	ICA 24
	Thursday	12/2		COLUMN DESIGN AND DRAWINGS DUE	Project 08
FINAL REPORT DUE				Project 09	
PROJECT PRESENTATIONS- DURING CLASS				Project 10	
	Tuesday	12/7		PROJECT TEAM EVALUATIONS DUE; NO FINAL EXAM	Project 11

15: End Notes

- ¹ <https://www.angelo.edu/live/profiles/6463-anthony-battistini>
- ² <http://www.mastan2.com/download.html>
- ³ <http://edu.iesweb.com/>
- ⁴ <https://blackboard.angelo.edu/>
- ⁵ <https://www.angelo.edu/student-handbook/code-of-student-conduct/misconduct.php>
- ⁶ <https://www.angelo.edu/live/profiles/6463-anthony-battistini>
- ⁷ <https://www.angelo.edu/current-students/registrar/final.php>
- ⁸ <https://www.angelo.edu/current-students/student-handbook/>
- ⁹ <https://www.angelo.edu/academics/catalog/>
- ¹⁰ <https://www.angelo.edu/current-students/disability-services/>
- ¹¹ <http://www.angelo.edu/incident-form>
- ¹² <https://www.angelo.edu/current-students/title-ix/>
- ¹³ <http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of>
- ¹⁴ <https://www.angelo.edu/content/files/14197-op-1011-grading-procedures>
- ¹⁵ <https://www.angelo.edu/covid-19/>
- ¹⁶ <http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php>
- ¹⁷ https://www.angelo.edu/current-students/writing-center/academic_honesty.php