

1: Course Number and Name

- a. **CENG 4363:** Steel Design, Spring 2022
- b. Section 010, Tuesdays and Thursdays, 9:30 – 10:45am, VIN 238

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:**
 - i. AISC Steel Construction Manual, 15th ed., American Institute of Steel Construction, 2017, ISBN 978-1-56424-007-1.
- b. **Recommended Textbooks:**
 - i. Geschwindner, L., Liu, J., and Carter, C., Unified Design of Steel Structures, 3rd ed., Louis F. Geschwindner, 2017, ISBN 978-1543207521.
 - ii. Segui, W., Steel Design, 6th ed., Cengage Learning, 2018, ISBN: 978-1-337-09474-0.
 - iii. Salmon, C., Johnson, J., and Malhas, F., Steel Structures, 5th ed., Pearson Prentice Hall, 2009, ISBN 978-0-13-188556-1. **Does not correlate with AISC Steel Construction Manual, 15th ed.
 - iv. Steel Design Guides 1-36, AISC. Available for download through [AISC Website](#)² with free student membership.
- c. **Software:**
 - i. Microsoft Word, Excel, PowerPoint or equivalent
 - ii. Matrix Structural Analysis Software
 - i. MASTAN2 v3.5, Ziemian, Ronald and William McGuire- available for free download at the [MASTAN2 Website](#)³; or
 - ii. VisualAnalysis v19.0, Integrated Engineering Software, IES- available for free download at the [Visual Analysis Website](#)⁴; or
 - iii. Equivalent
 - iii. CAD Drawing Software such as AutoCAD and Autodesk Revit
- 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.

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

6: Specific Course Information

- a. **Catalog Description:** Design and behavior of the elements of steel structures with AISC specifications, proportioning members and connections using load and resistance factor design.
- 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. Design and analyze tension members considering yield and rupture failure modes.
 3. Design and analyze simple bolted and welded connections.
 4. Design and analyze steel compression members.
 5. Design and analyze steel beams for flexure, shear, and deflection.
 6. Design and analyze steel members subjected to combined flexure and axial loads.
 7. Use LRFD to design low-rise steel 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	6	7
1. Solve Problems	X	X	X	X	X	X	
2. Design	X	X	X	X	X	X	X
3. Communication							X
4. Ethics & Professionalism							
5. Teamwork							X
6. Experimentation							
7. Acquire New Knowledge							

8: Topics Covered

1. Design for Stability; Direct Analysis Method
2. Design Philosophy
3. Steel Chemistry and Mechanical Properties
4. Compression Members: Elastic and Inelastic Buckling, Direct Analysis Method, Design
5. Beams: Yield Moment, Plastic Moment, Lateral Torsional Buckling, Shear, Design
6. Tension Members: Yielding, Fracture, Block Shear, Design
7. Simple Connections: Bolted Connections, Welded Connections, Design
8. Special Topics; Design Project

9: Course Delivery and Communications

9.1: Delivery Methods

The course will meet twice a week for class, where the instructor will be communicating engineering theories and information to the students. You should 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](#)⁵ 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 will be 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- I want you to get the most out of your learning experience!

Academic integrity is expected from all students at all times in accordance with [Part I, Section B.1](#)⁶ 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's office hours can be found on his [faculty website](#)⁷.

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

Table 2: Steel Design Skills

Skill Number	Required Skills (3)
01	Design a 3-5 story, steel structure in a team setting
02	Develop spreadsheet(s) to design steel members/connections in accordance with AISC 360-16 Specification
03	Steel Highlights Presentation
	Major Skills (19)
04	Apply the direct analysis method to the design of a simple frame
05	Apply LRFD to determine the factored axial force, shear force, and bending moments in a determinate structure
06	Extend LRFD to determine the factored axial force, shear force, and bending moments in an indeterminate structure
07	Draw a typical steel stress-strain curve and an appropriate model of material behavior
08	Calculate M_y and M_p for a built-up steel section
09	Analyze steel beams
10	Design steel beams
11	Analyze steel compression members
12	Design steel compression members
13	Analyze the yielding capacity of steel members and connections
14	Analyze the fracture capacity of steel members and connections
15	Analyze the block shear capacity of steel members and connections
16	Analyze steel tension members for member limit states
17	Design steel tension members for member limit states
18	Analyze steel connections for bolt limit states
19	Analyze steel connections for all tension limit states
20	Design steel tension members for all limit states
21	Analyze the strength of welded connections
22	Design welded connections
	Minor Skills (12)
23A	Identify steel building systems and critique the structural aesthetics (Team)
23B	Identify steel building systems and critique the structural aesthetics (Individual)
24	Critique the structural aesthetics of steel bridges
25	Describe the direct analysis method and differentiate between linear and nonlinear geometric and material analyses
26	Identify the chemistry of structural steels
27	Explain the chemistry and appropriate use of weathering steel
28	Identify steel member shapes
29	Find basic design information using the AISC Manual
30	Analyze steel compression members with slender elements
31	Analyze steel compression members capacity for flexural-torsional buckling loads
32	Explain methods for high strength bolt installation
33	Install high strength bolted connections properly
34	Analyze beam-columns

- A** Engineering calculations are well organized and clearly follow engineering mechanics principles and/or the AISC 360 specification with well documented references; all necessary graphs are plotted; stress-strain profiles for beams are neatly drawn; final designs are neatly sketched using CAD or other computer software; calculation results are correct and an effort is made to optimize the design
- B** Engineering calculations are organized and follow engineering mechanics principles and/or the AISC 360 specification but references are not given/unclear; necessary graphs are plotted but not neat; stress-strain profiles for beams are drawn; final designs are sketched; calculation results are correct
- C** Engineering calculations are not organized and may not clearly follow engineering mechanics principles and/or the AISC 360 specification; important checks are missing; some graphs are plotted; stress-strain profiles for beams may not be shown; final designs are sketched; calculation results are mostly correct with minimal errors
- D** Engineering calculations are not organized and do not clearly follow engineering mechanics principles and/or the AISC 360 specification; graphs are missing; stress-strain profiles for beams are not drawn; final designs are not sketched; calculation results are incorrect and potentially unsafe
- F** Engineering calculations are not organized and do not clearly follow engineering mechanics principles and/or the AISC 360 specification; graphs are missing or are not done; stress-strain profiles are not shown; final designs are not sketched; calculation results are incorrect, unsafe; work was not submitted

11.1: Final Grade Determination

- A** Must receive grade of A on 3/3 Required Skills; must receive grade of A on 15/19 Major Skills; must receive grade of A on 9/12 Minor Skills; must have B or better on ALL Skills
- B** Must receive grade of A or B on 3/3 Required Skills; must receive grade of A or B on 15/19 Major Skills; must receive grade of A or B on 9/12 Minor Skills; must have C or better on ALL Skills
- C** Must receive grade of A, B, or C on 3/3 Required Skills; must receive grade of A, B, or C on 15/19 Major Skills; must receive grade of A, B, or C on 9/12 Minor Skills; must have less than 5 F's in ALL Skills
- D** Must receive grade of A, B, C, or D on 3/3 Required Skills; must receive grade of A, B, C or D on 15/19 Major Skills; must receive grade of A, B, C, or D on 9/12 Minor Skills; must have less than 7 D's or F's in ALL Skills
- F** Does not meet minimum requirements for score of D

11.2: 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 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 (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
- 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.

11.3: Major Skills / Minor Skills

- Skills assignments are due on Blackboard as specified on the course schedule or posted with the assignment on Blackboard.
- Late work 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 work 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 problem, 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 skills, unless specified on Blackboard; 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.
- 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 skills. Therefore, it is imperative that each student attempt to solve each skill as it may be the only practice you will have to reinforce the learned material.

- **All skills 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.

11.4: Exams

- Make-up exams will only be given for extenuating circumstances, unless prior arrangements with the instructor are agreed upon.
- Exams may be open textbook or notes, and the use of the AISC Steel Manuals and 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](#)⁸) is on Thursday, May 12, 2022 from 8:00 – 10:00am.

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](#)⁹ and [Angelo State University Catalog](#)¹⁰.

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](#)¹¹. The employee charged with the responsibility of reviewing and authorizing accommodation requests is:

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

The University prohibits discrimination based on sex, which includes pregnancy, sexual orientation, gender identity, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing

all forms of gender-based harassment or discrimination including: sexual assault, sex-based discrimination, sexual exploitation, sexual harassment, public indecency, interpersonal violence (domestic violence and/or dating violence), and stalking. As a faculty member, I am a Responsible Employee meaning that I am obligated by law and ASU policy to report any allegations I am notified of to the Office of Title IX Compliance.

Students are encouraged to report any incidents of sexual misconduct directly to ASU's Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator at:

Michelle Boone, J.D.
Director of Title IX Compliance/Title IX Coordinator
Mayer Administration Building, Room 210
325-486-6357, michelle.boone@angelo.edu

You may also file a report online 24/7 at [Angelo State's Online Incident Report](#)¹²

If you are wishing to speak to someone about an incident in confidence you may contact the *University Health Clinic and Counseling Center* at 325-942-2173 or the *ASU Crisis Helpline* at 325-486-6345.

For more information about resources related to sexual misconduct, Title IX, or Angelo State's policy please visit: [Angelo State's Title IX Webpage](#)¹³.

12.4: 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](#)¹⁴ 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](#)¹⁵ for more information.

12.6: Information About COVID-19

Please refer to ASU's [COVID-19 \(Coronavirus Update\)](#)¹⁶ 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](#)¹⁷ 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](#)¹⁸.

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. Detailed reading and homework assignments along with updates to this schedule will be provided via Blackboard. Please note the references below to the Segui textbook and throughout the course notes, reference the 5th edition.

Table 3: Course Lesson Outline- Tentative

Lesson	Day	Date	AISC Manual	Segui 5 th ed Text	Notes/Topic	Assignment Due
01	Tuesday	1/18			Syllabus, Course Discussion, Introduction	
02	Thursday	1/20	C, App. 1,7,8		Stability: Direct Analysis Method	P 01
03	Tuesday	1/25			Direct Analysis Stability Module (VIN 245)	V 01; V 02
04	Thursday	1/27	B	Ch. 2	LRFD Design Methodology; Tributary Loads	P 02
05	Tuesday	2/1			LRFD Analysis Problems	
06	Thursday	2/3	A	Ch. 1	Steel- A History; The Basics; AISC Steel Shapes; Stress-Strain; AISC Manual Intro	
07	Tuesday	2/8	ALL		AISC Manual Challenge	
08	Thursday	2/10	F, B, G	Ch. 5	Beams I: Yield Moment, Plastic Moment	P 03
09	Tuesday	2/15	B4, F2		Beams II: My, Mp, Mn Problems	
10	Thursday	2/17	F, B, G, Part 3	Ch. 5	Beams III: Local Buckling, LTB, Design	
11	Tuesday	2/22	G, Part 3		Beams IV: Shear, Beam Design	
12	Thursday	2/24	E, B	Ch. 4	Compression I: Euler Buckling; Inelastic Buckling	
13	Tuesday	3/1	E1, E2, E3, Part 4		Compression II: Compression Member Examples	
14	Thursday	3/3	B4, E4, E7, Part 4		Compression III: Local Buckling, Torsional Buckling, Flexural Torsional Buckling	P 04
15	Tuesday	3/8	Part 4	Ch. 4	Compression IV: Member Design	
16	Thursday	3/10	D	Ch. 3	Tension I: Yielding, Fracture	
	Tuesday	3/15			NO CLASS- SPRING BREAK	
	Thursday	3/17			NO CLASS- SPRING BREAK	
	Tuesday	3/22			EXAM I	
17	Thursday	3/24			Tension II: Yielding, Fracture Problems	P 05
18	Tuesday	3/29	D, J	Ch. 3	Tension III: Block Shear, Design	
19	Thursday	3/31			Tension IV: Block Shear, Design Problems	P 06
20	Tuesday	4/5			Tension V: Design	
21	Thursday	4/7	J	Ch. 7	Bolts I: Bearing, Shear Tear Out, Bolt Shear	
22	Tuesday	4/12			Bolts II: High Strength Bolt Lab	
23	Thursday	4/14			Bolts III: Connection Problems	
24	Tuesday	4/19	J	Ch. 7	Welds I: Processes, Analysis, Design	
25	Thursday	4/21	J	Ch. 7	Welds II: Connection Problems	P 07
26	Tuesday	4/26			Welds III: Weld Lab	
	Thursday	4/28			EXAM II	
27	Tuesday	5/3			Special Topics; Design Project	
	Thursday	5/5			DESIGN PROJECT PRESENTATIONS 9:30-10:45am	P 08-10
	Thursday	5/12			NO FINAL EXAM FOR THIS CLASS	P 11

15: End Notes

- ¹ <https://www.angelo.edu/live/profiles/6463-anthony-battistini>
- ² <https://www.aisc.org/aisc-membership/member-types/student/>
- ³ <http://www.mastan2.com/download.html>
- ⁴ <http://edu.iesweb.com/>
- ⁵ <https://blackboard.angelo.edu/>
- ⁶ <https://www.angelo.edu/student-handbook/code-of-student-conduct/misconduct.php>
- ⁷ <https://www.angelo.edu/live/profiles/6463-anthony-battistini>
- ⁸ <https://www.angelo.edu/current-students/registrar/final.php>
- ⁹ <https://www.angelo.edu/current-students/student-handbook/>
- ¹⁰ <https://www.angelo.edu/academics/catalog/>
- ¹¹ <https://www.angelo.edu/current-students/disability-services/>
- ¹² <http://www.angelo.edu/incident-form>
- ¹³ <https://www.angelo.edu/current-students/title-ix/>
- ¹⁴ <https://angelo.policystat.com/policy/10659368/latest/>
- ¹⁵ <https://angelo.policystat.com/policy/10659448/latest/>
- ¹⁶ <https://www.angelo.edu/covid-19/>
- ¹⁷ <http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php>
- ¹⁸ https://www.angelo.edu/current-students/writing-center/academic_honesty.php