CENG 3361: Structural Analysis I

1: Course Logistics
- Semester: Fall 2018
- Section: 010
- Class Days: Tuesday and Thursday
- Class Time: 3:30pm – 4:45pm

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: Required Materials
3.1: Required Textbook
None

3.2: Recommended Textbooks
The textbook listed below is recommended only. The notes provided in class may be sufficient to learn the required material; however, I would prefer that you have a structural analysis textbook available for reference, especially if you want to be a structural engineer. It is my opinion that this course could be the most difficult/demanding one I teach, so many students find it useful to have a textbook with extra problems and more explanation regarding the concepts. There are numerous textbooks/editions available, but I think the Hibbeler textbook is both concise and thorough. In fact, because I like this Structural Analysis textbook the best, I choose to adopt Hibbeler in the Statics and Mechanics of Materials for consistency. My class notes will reference chapters/sections in the recommended textbook. As the textbook is an older edition, cost is hopefully not prohibitive.


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 may need to be printed and brought class.
4: Prerequisites
- ENGR 2332 Mechanics of Materials

5: Course Description

6: Student Learning Outcomes
When you complete this course, you should be able to:

1. Identify and explain the purpose of various structural elements and forms
2. Identify different types of loads and determine load path
3. Construct idealized structural models from real-world conditions
4. Design a truss using simplified LRFD provisions for tension and compression members, including elastic flexural buckling
5. Evaluate the determinacy and stability of structures
6. For a statically determinate truss, beam or frame subjected to an arbitrary load:
   a. Compute internal forces (axial force, shear force, and bending moment) at any point within the structure
   b. Determine internal force functions for any member of the structure
   c. Construct internal force diagrams for any member of the structure
   d. Draw influence lines for any member of the structure for a given structural response
   e. Compute the deflection and slope (if applicable) at any point in the structure
7. Compute reactions and internal forces in statically indeterminate structures using classical and matrix methods
8. Analyze structures using structural analysis software and interpret results

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>
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<tbody>
<tr>
<td>1</td>
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<tr>
<td>2</td>
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</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.1 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>Participation/In-Class Assignments</td>
<td>5%</td>
</tr>
<tr>
<td>Structure Report/Presentation</td>
<td>5%</td>
</tr>
<tr>
<td>Truss Design Project</td>
<td>15%</td>
</tr>
<tr>
<td>Homework</td>
<td>15%</td>
</tr>
<tr>
<td>Exam I</td>
<td>15%</td>
</tr>
<tr>
<td>Exam II</td>
<td>15%</td>
</tr>
<tr>
<td>Final Exam</td>
<td>30%</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**

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

10.3: **Class Attendance, Participation, Timeliness, and In-Class Assignments**

- 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
  - 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 3:30pm on the day specified on the course schedule.
- Late homework is still accepted, but may not be accepted for full credit, unless previous arrangements with the instructor are made.
- Late homework is subject to additional deductions at the discretion of the instructor, usually based on the degree of lateness and homework history of the student.
- 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.
- 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.
• Every homework problem will be graded out of 10 pts (if 2 problems, 20 pts total; if 4 problems, 40 pts total).
• Due to the length of solving some problems, it is possible students may only have the opportunity to solve one of a particular 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.
• 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 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 final exam will be given according to the Angelo State University Final Exam Schedule, which for this course will be Thursday, December 13, 2018 from 3:30pm-5:30pm.

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 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 to disciplinary action and possible expulsion from ASU.

The College of Science and Engineering adheres to the Statement of Academic Integrity.

11.6.2: Plagiarism

Plagiarism is a serious topic covered in ASU’s Academic Integrity Policy 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.

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.
- Some pictures/videos may be included on social media by the ENGR 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>Destination</th>
<th>Text</th>
<th>Notes/Topic</th>
<th>Assignment Due</th>
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<tbody>
<tr>
<td>01</td>
<td>Tuesday</td>
<td>8/28</td>
<td>San Angelo, TX</td>
<td>Syllabus, Course Discussion, Structures Trivia</td>
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<tr>
<td>02</td>
<td>Thursday</td>
<td>8/30</td>
<td>Puerta Cabeza, Nicaragua</td>
<td>1.1-1.2; 3.1; 5.1; 5.4</td>
<td>Classification of Structures</td>
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<tr>
<td>03</td>
<td>Tuesday</td>
<td>9/4</td>
<td>Rome, Italy</td>
<td>1.3</td>
<td>Classification of Loads</td>
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<tr>
<td>04</td>
<td>Thursday</td>
<td>9/6</td>
<td>Kobe, Japan</td>
<td>1.4</td>
<td>Design Methodology; LRFD vs ASD</td>
<td>Homework 01</td>
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<tr>
<td>05</td>
<td>Tuesday</td>
<td>9/11</td>
<td>Atlantic City, NJ</td>
<td>2.1-2.3</td>
<td>Load Path; Tributary Areas</td>
<td>Homework 02</td>
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<td>06</td>
<td>Thursday</td>
<td>9/13</td>
<td>Seville, Spain</td>
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<td>07</td>
<td>Tuesday</td>
<td>9/18</td>
<td>Toronto, Canada</td>
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<td>Compression Member Design</td>
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<td>08</td>
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<td>9/20</td>
<td>Edinburgh, Scotland</td>
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<td>Truss Bridge Design; Design Project Outline</td>
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<td>09</td>
<td>Tuesday</td>
<td>9/25</td>
<td>Shanghai, China</td>
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<td>Thursday</td>
<td>9/27</td>
<td>Sydney, Australia</td>
<td>3.2-3.4</td>
<td>Determinate Truss Analysis I</td>
<td>Project 01</td>
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<td>Tuesday</td>
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<td>Thursday</td>
<td>10/4</td>
<td>Berlin, Germany</td>
<td>4.1-4.3</td>
<td>Beams and Frames- N, V, M Diagrams I</td>
<td>Homework 05</td>
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<td>Tuesday</td>
<td>10/9</td>
<td>Kuala Lumpur, Malaysia</td>
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<td>Beams and Frames- N, V, M Diagrams II</td>
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<td>Tuesday</td>
<td>10/16</td>
<td>Rio de Janeiro, Brazil</td>
<td>4.4-4.5</td>
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<td>Manila, Philippines</td>
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<td>Thursday</td>
<td>10/25</td>
<td>Tehran, Iran</td>
<td>8.1-8.3</td>
<td>Deflections - Integration, Tables</td>
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<td>18</td>
<td>Tuesday</td>
<td>10/30</td>
<td>Accra, Ghana</td>
<td>9.3-9.4; 9.7</td>
<td>Deflections - Virtual Work I</td>
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<td>19</td>
<td>Thursday</td>
<td>11/1</td>
<td>Bogota, Colombia</td>
<td>9.7</td>
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<tr>
<td>20</td>
<td>Tuesday</td>
<td>11/6</td>
<td>Cairo, Egypt</td>
<td>9.8</td>
<td>Deflections - Virtual Work III</td>
<td>Homework 09</td>
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<td>21</td>
<td>Thursday</td>
<td>11/8</td>
<td>Dhaka, Bangladesh</td>
<td>10.1-10.4</td>
<td>Indeterminate Structures- Force Method I</td>
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<tr>
<td>22</td>
<td>Tuesday</td>
<td>11/13</td>
<td></td>
<td></td>
<td>EXAM II</td>
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<td>Thursday</td>
<td>11/15</td>
<td>Mexico City, Mexico</td>
<td>10.5; 10.8</td>
<td>Indeterminate Structures- Force Method II</td>
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<td>Tuesday</td>
<td>11/20</td>
<td>Taipei, Taiwan</td>
<td>14.1-14.2</td>
<td>Indeterminate Structures- Stiffness Method I</td>
<td>Homework 11</td>
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<td>Date</td>
<td>Destination</td>
<td>Text</td>
<td>Notes/Topic</td>
<td>Assignment Due</td>
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<td>24</td>
<td>Tuesday</td>
<td>11/27</td>
<td>New York, NY</td>
<td>14.3-14.6</td>
<td>Indeterminate Structures- Stiffness Method II</td>
<td>Homework 12</td>
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<td>11/29</td>
<td>Dubai, United Arab Emirates</td>
<td>15.1-15.4</td>
<td>Indeterminate Structures- Stiffness Method III, Practice</td>
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<td>25</td>
<td>Tuesday</td>
<td>12/4</td>
<td>Outer Space, Milky Way Galaxy</td>
<td>Final Exam Review; Structures Escape Challenge</td>
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<td>Project 04, 05A; Homework 13</td>
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<td></td>
<td>Thursday</td>
<td>12/6</td>
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<td>Truss Design Project Testing</td>
<td>Project 05B</td>
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<td></td>
<td>Friday</td>
<td>12/7</td>
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<td><strong>FINAL PROJECT REPORT DUE (NO CLASS)</strong></td>
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<td>Thursday</td>
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<td><strong>FINAL EXAM, 3:30pm-5:30pm</strong></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/registrar_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