1: Course Number and Name

a. **CENG 3362**: Structural Analysis II, Spring 2022
b. Section 010, Tuesdays/Thursdays 2:00pm – 3:15pm, 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**: None
b. **Recommended Textbook**: McGuire, W., Gallagher, R., and Ziemian, R., Matrix Structural Analysis. 2nd ed., Ronald Ziemian, 2014, ISBN: 978-0471129189.
c. **Software**:
    i. Microsoft Word, Excel, PowerPoint or equivalent
    ii. Computer Programming Software
        i. MATLAB R2015A, MathWorks- available in the Engineering Computer Lab (VIN 245) and on select ASU computers on-campus
    iii. Matrix Structural Analysis Software
        i. MASTAN2 v3.5, Ziemian, Ronald and William McGuire- available for free download at the MASTAN2 Website[2]; or
        ii. VisualAnalysis v19.0, Integrated Engineering Software, IES- available for free download at the Visual Analysis Website[3]; or
        iii. Equivalent
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.

Laptops and tablets may be used in-class and on the exam.

6: Specific Course Information

a. **Catalog Description:** Analysis of statically indeterminate structures using approximation methods, energy, and/or matrix methods. Direct stiffness and flexibility methods are discussed as are a variety of application in structural analysis software.
b. **Prerequisites**:
    a. CENG 3361 Structural Analysis I
    b. One of the following: CS 1314 Introduction to Programming and Problem Solving, CS/COSC 1336 Computer Science I, or ENGR 2304 Programming for Engineers
    c. CENG majors only or departmental permission
c. **Required or elective**: Elective for BSCE Majors (satisfies Engineering/Math/Science elective)

7: Specific Goals for the Course

    a. Course Learning Outcomes:
1. Derive local element and global structure stiffness matrices for trusses, beams, and frames
2. Use approximate and matrix methods to solve deflections and rotations in statically determinate and indeterminate trusses, beams, and frames subjected to concentrated forces, moments, distributed loads, temperature effects, and/or non-zero prescribed displacements
3. Use structural analysis software to verify hand calculations and perform analyses on more complex real-world structures
4. Design computer code to perform basic matrix structural analysis on trusses, beams, and frames
5. Communicate project results in oral presentations and technical reports
6. Employ various linear algebraic methods to solve large systems of simultaneous equations
7. Time-permitting, explain and perform advanced structural analysis concepts such as:
    a. Nonlinear material analysis
    b. Nonlinear geometric analysis
    c. Eigenvalue buckling analysis
    d. Torsion
    e. Other topics to be determined

    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			
3. Communication					X		
4. Ethics & Professionalism							
5. Teamwork							
6. Experimentation							
7. Acquire New Knowledge			X	X			X

8: Topics Covered

1. Linear Algebra/Matrix Math: Addition, Multiplication, Determinants, Inverse
2. Direct Stiffness Method for Trusses, Beams, and Frames including support settlements, temperature effects, and fabrication errors
3. Development of computer code to perform matrix structural analysis
4. Use of computer software to perform structural analysis
5. Special Topics
6. Projects

9:   Course Delivery and Communications

9.1:   Delivery Methods

The course will meet two times a week for class, where the instructor will be communicating new engineering theories and information to the students. Students will also work on problems and projects during select classes.

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. The course material covered by the instructor does not follow one particular textbook.

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 and instructor is required.

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](#)[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

Item	Percent
Participation/In-Class Assignments:	10%
Homework	15%
Exam	20%
Project 01- Truss Analysis Program	25%
Project 02- Real-World Analysis	15%
Project 03- Continuous Learning	15%
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 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.

11.4: Homework

- Homework is due on Blackboard by 2:00pm on the day specified on the course schedule or announced in-class or posted on Blackboard.
- Late homework may not be accepted for full credit, unless previous arrangements with the instructor are made. 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 have an indicated point value.
- 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.

11.5: Exams

- Make-up exams will only be given for extenuating circumstances, unless prior arrangements with the instructor are agreed upon.
- The exam will be open textbook or notes. Details will be discussed closer to the exam time.
- The exam will be 1.25 hours long and will be given during the class period indicated on the course schedule.
- There will not be a final exam in the course, but the Project 03 presentations may be given during the allotted final exam period according to the Angelo State University Final Exam Schedule[7], which for this course will be Tuesday, May 10, 2022 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:

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[11]

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[12].

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[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:   Required Use of Masks/Facial Coverings

As a member of the Texas Tech University System, Angelo State University has adopted the mandatory [Facial Covering Policy](15) to ensure a safe and healthy classroom experience. Current research on the COVID-19 virus suggests there is a significant reduction in the potential for transmission of the virus from person to person by wearing a mask/facial covering that covers the nose and mouth areas. Therefore, in compliance with the university policy students in this class are required to wear a mask/facial covering before, during, and after class. Faculty members may also ask you to display your daily screening badge as a prerequisite to enter the classroom. You are also asked to maintain safe distancing practices to the best of your ability. For the safety of everyone, any student not appropriately wearing a mask/facial covering will be asked to leave the classroom immediately. The student will be responsible to make up any missed class content or work. Continued non-compliance with the Texas Tech University System Policy may result in disciplinary action through the Office of Student Conduct.

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.

- o The photos/videos are for personal use only (not posted publicly), unless otherwise discussed.
- o 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	Text	Notes/Topic	Assignment Due
01	Tuesday	1/18		Syllabus, Course Discussion, "The Matrix-Red/Blue Pill" Group Ice Breaker	
02	Thursday	1/20		Linear Algebra I: Matrix Math	
03	Tuesday	1/25		Linear Algebra II: Systems of Linear Equations	Homework 01
04	Thursday	1/27		Linear Algebra III: Determinants, Inverse	
	Tuesday	2/1		Project 01A Introduction; Computer Programming Refresher (VIN 245)	Homework 02
05	Thursday	2/3		DSM I: 1D Axial Elements	
06	Tuesday	2/8		DSM II: 1D Axial Element Practice	Homework 03
07	Thursday	2/10		DSM III: 2D Transformation I; Project 01B Introduction	
	Tuesday	2/15		Project 01 Work in VIN 245 Computer Lab	Homework 04
08	Thursday	2/17		DSM IV: 2D Indeterminate Truss	
	Friday	2/18		**Project 01A Due on Blackboard**	Project 01A
09	Tuesday	2/22		DSM V: Settlements and Temperature Effects	Homework 05
10	Thursday	2/24		DSM VI: 1D Beams	
11	Tuesday	3/1		DSM VII: 1D Beams, Distributed Loads	Homework 06
12	Thursday	3/3		DSM VIII: 2D Frames	
	Tuesday	3/8		Project 01 Work in VIN 245 Computer Lab	Homework 07
	Thursday	3/10		**EXAM**	
	Friday	3/11		**Project 01B Due on Blackboard**	Project 01B
	Tuesday	3/15		**NO CLASS- SPRING BREAK**	
	Thursday	3/17		**NO CLASS- SPRING BREAK**	
13	Tuesday	3/22		Project 02: Ideas and Inspiration (Possible ASU Museum Site Tour)	
14	Thursday	3/24		Project 02, 03: Scope and Group Meetings	
15	Tuesday	3/29		Project 02: RISA 2D Demo; Interpretation 101	
16	Thursday	3/31		Approximate Methods I- Trusses	
17	Tuesday	4/5		Approximate Methods II- Portal Method	
18	Thursday	4/7		Approximate Methods III- Cantilever Method	
19	Tuesday	4/12		Common Mistakes	Homework 08
20	Thursday	4/14		Is My Analysis Correct?	
	Tuesday	4/19		Project 02 Work in VIN 245 Computer Lab	Homework 09
	Thursday	4/21		Project 02 Work in VIN 245 Computer Lab	
	Friday	4/22		**Project 02 Due on Blackboard**	Project 02
21	Tuesday	4/26		Plastic Analysis and Collapse Loads	
22	Thursday	4/28		Cross Frame Stiffness; Project 03 Work	
	Tuesday	5/3		Project 03 Presentations	Project 03
	Thursday	5/5		Project 03 Presentations	
	Tuesday	5/10		**Project 03 Presentations: 1:00pm-3:00pm**	

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/services/registrars_office/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] https://angelo.policystat.com/policy/10659368/latest/

[14] https://angelo.policystat.com/policy/10659448/latest/

[15] http://www.texastech.edu/downloads/ttus-policy-face-coverings.pdf

[16] http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php

[17] https://www.angelo.edu/current-students/writing-center/academic_honesty.php