ENGR 2301: Engineering Mechanics – Statics (CRN 12886) / Lab (CRN 13034)

1: Course Logistics

- Semester: Fall 2020
- Section: 010
- Class Days: Monday, Wednesday, Friday
- Class Time: 8:00am – 8:50 am
- Location: VIN 238

- Lab Section: 01Z
- Lab Day: Tuesday
- Lab Time: 8:00am – 8:50 am
- Location: VIN 238

2: Instructor Information

- Instructor: Gustavo Vargas Silva, PhD
- Email: gustavo.vargas-silva@angelo.edu
- Phone: (325) 486-5540
- Office: Vincent Building 270
- Office Hours: See Engineering Homepage

3: Required Materials

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 Statics textbook available for reference. The concepts presented in this course may be more challenging than those in physics and calculus and the use of a textbook for extra clarification may be required. There are numerous textbooks/editions available that would be suitable. The class notes will reference chapters/sections in the recommended textbook.


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

4: Prerequisites and co-requisites

- PHYS 2425 Fundamentals of Physics I
- Credit for or concurrent enrollment in MATH 2314 Calculus II

5: Course Description

Catalog: Basic theory of engineering mechanics, using calculus, involving the description of forces, moments, and couples acting on stationary engineering structures; equilibrium in two and three dimensions; free-body diagrams; friction; centroids; centers of gravity; and moments of inertia.

Objective: The objective of this course is to apply the principles of statics (the study of physical bodies subjected to balanced force systems) to engineering problems.

6: Student Learning Outcomes

When you complete this class you should be able to:

1. Calculate resultant force vectors in two and three dimensions
2. Construct accurate free body diagrams and identify the loads/support conditions acting on structural systems
3. Apply equilibrium equations to particles and rigid bodies
4. Analyze internal forces in trusses and beams
5. Analyze impending motion of rigid bodies including the effect of friction
6. Determine the centroid and moment of inertia of member cross sections

7: Course Outcome Mapping

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

Table 1: Student Learning Outcome Mapping to ABET Criterion 3

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

8: Course Delivery (Synchronous Remote Sessions)

To maintain academic quality while accommodating social distancing needs this semester, this course will use a split delivery model that combines face-to-face teaching with remote instruction.

The goal is to provide face-to-face instruction to students who want to return to campus, while also allowing students who may need to learn remotely to participate via virtual class sessions.

How Does It Work?

Your class will be divided and you will be placed into a smaller group of students to maintain physical distancing requirements in our assigned classroom space.

Your assigned group will receive a schedule of in-person class meetings. This schedule is not flexible. For instance, if you are supposed to attend class on a Monday, you cannot elect to go on Wednesday with another class group instead.

When you are not in the physical class, you will attend live remote sessions at the same time as our scheduled course. You will also be expected to complete coursework via Blackboard.

Please refer to this Health and Safety web page for updated information about campus guidelines as they relate to the COVID-19 pandemic.

9: Course Structure, Communication, Policies

The course will meet three 1-hour lectures per week, and one 1-hour lab session per week, where the instructor will be communicating engineering theories and information to the students.

Faculty will respond to email and/or telephone messages within 24 hours during working hours Monday through Friday. Weekend messages may not be returned until Monday.
Written communication via email: All private communication will be done exclusively through your ASU email address. Check frequently for announcements and policy changes. In your emails to faculty, include the course name and section number in your subject line.

Virtual communication: Office hours and/or advising may be done with the assistance of the telephone, Collaborate, Skype, etc.

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.

10: 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.

11: Graded Material

11.1: Final Grades

<table>
<thead>
<tr>
<th>Component</th>
<th>Percentage</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework/In-Class Assignments:</td>
<td>10%</td>
</tr>
<tr>
<td>Exam I:</td>
<td>18%</td>
</tr>
<tr>
<td>Exam II:</td>
<td>16%</td>
</tr>
<tr>
<td>Exam III:</td>
<td>16%</td>
</tr>
<tr>
<td>Final Exam:</td>
<td>20%</td>
</tr>
<tr>
<td>Final Project:</td>
<td>20%</td>
</tr>
</tbody>
</table>
11.2: Grading Scale
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.

The instructor will determine letter grades for the course using his professional judgment, and the
following standards as described in the University Catalog:

<table>
<thead>
<tr>
<th>A</th>
<th>Excellent work</th>
<th>B</th>
<th>Good work</th>
<th>C</th>
<th>Average work</th>
<th>D</th>
<th>Poor work</th>
<th>F</th>
<th>Failing work</th>
</tr>
</thead>
</table>

11.3: Class Attendance, Participation, Timeliness, and In-Class Assignments
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.

In-class assignments will be given periodically during lecture 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. Make-up participation or in-
class assignments will not be given.

11.4: Homework
Homework should be turn-in at the beginning of the class on the day it is due (course schedule).

Late homework may not be accepted for full credit.

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.

Homework grades will primarily be based on thoroughness, neatness and completeness.

Any handwritten homework should be performed 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). All pages must
be stapled together.

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.

Graded exams, homework and/or lab reports will be returned individually.
11.5: **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 a formula sheet will be provided. Details will be discussed closer to the exam time.

Exams I, II, and III will be 50 minutes long and will be given during the class periods indicated on the course schedule. The final exam will be given during the university specified exam time, which for this course will be Friday, November 20, 2020 from 8:00 -10:00 a.m.

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 and Angelo State University Catalog.

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.

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.

12.3: **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.

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 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 for more information.
12.6: Student Conduct Policies

12.6.1: Academic Integrity

Students are expected to maintain complete honesty and integrity in all work. Any student found guilty of any form of dishonesty in academic work is subject of disciplinary action and possible expulsion from ASU.

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

12.6.2: 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.

12.6.3: 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.

12.6.4: 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 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.

13: Course Specific Information

13.1: 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 😊

14: 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.

15: Modifications to the Syllabus

This syllabus, including grade evaluation and course schedule, is subject to modification. In particular, the COVID-19 pandemic may require significant changes in course delivery and content on potentially short notice.
16: Course Outline

This is the course outline. Detailed homework assignments along with updates to this schedule will be provided via Blackboard.

<table>
<thead>
<tr>
<th>Lesson</th>
<th>Week</th>
<th>Day</th>
<th>Date</th>
<th>Text</th>
<th>Handout</th>
<th>Notes/Topic</th>
<th>Homework</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>M</td>
<td>Aug 17</td>
<td>1.1-6</td>
<td>01</td>
<td>Introduction, Basic quantities, Units</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>2</td>
<td>W</td>
<td>Aug 19</td>
<td>2.1-3</td>
<td>02</td>
<td>Vectors, Operations, Force Addition</td>
<td>01</td>
</tr>
<tr>
<td>3</td>
<td>2</td>
<td>F</td>
<td>Aug 21</td>
<td>2.4</td>
<td>03</td>
<td>Coplanar Force Addition</td>
<td>02</td>
</tr>
<tr>
<td>4</td>
<td>3</td>
<td>M</td>
<td>Aug 24</td>
<td>2.5-6</td>
<td>04</td>
<td>Cartesian Vectors</td>
<td>03</td>
</tr>
<tr>
<td>5</td>
<td>3</td>
<td>W</td>
<td>Aug 26</td>
<td>2.7-8</td>
<td>05</td>
<td>Position Vectors, Force along a line</td>
<td>04</td>
</tr>
<tr>
<td>6</td>
<td>3</td>
<td>F</td>
<td>Aug 28</td>
<td>2.9</td>
<td>06</td>
<td>Dot Product, Force Projection</td>
<td>05</td>
</tr>
<tr>
<td>7</td>
<td>3</td>
<td>M</td>
<td>Aug 31</td>
<td>3.1-3</td>
<td>07</td>
<td>Particle Equilibrium, FBD</td>
<td>06</td>
</tr>
<tr>
<td>8</td>
<td>4</td>
<td>W</td>
<td>Sep 02</td>
<td>3.4</td>
<td>08</td>
<td>3D Force Systems</td>
<td>07</td>
</tr>
<tr>
<td>9</td>
<td>4</td>
<td>F</td>
<td>Sep 04</td>
<td>4.1-4</td>
<td>09</td>
<td>2D Moments</td>
<td>08</td>
</tr>
<tr>
<td></td>
<td>4</td>
<td>M</td>
<td>Sep 07</td>
<td>-</td>
<td>-</td>
<td>LABOR DAY</td>
<td>-</td>
</tr>
<tr>
<td>10</td>
<td>4</td>
<td>W</td>
<td>Sep 09</td>
<td>4.1-4</td>
<td>10</td>
<td>3D Moments</td>
<td>09</td>
</tr>
<tr>
<td>11</td>
<td>4</td>
<td>F</td>
<td>Sep 11</td>
<td>4.1-4</td>
<td>11</td>
<td>3D Moments</td>
<td>09</td>
</tr>
<tr>
<td>12</td>
<td>5</td>
<td>M</td>
<td>Sep 14</td>
<td>4.6</td>
<td>12</td>
<td>Couples</td>
<td>10</td>
</tr>
<tr>
<td>13</td>
<td>5</td>
<td>W</td>
<td>Sep 16</td>
<td>4.7-8</td>
<td>13</td>
<td>Reducing Force-Couple Systems</td>
<td>11</td>
</tr>
<tr>
<td>14</td>
<td>5</td>
<td>F</td>
<td>Sep 18</td>
<td>4.9</td>
<td>14</td>
<td>Distributed Load</td>
<td>12</td>
</tr>
<tr>
<td></td>
<td>6</td>
<td>M</td>
<td>Sep 21</td>
<td>-</td>
<td>-</td>
<td>EXAM I</td>
<td>-</td>
</tr>
<tr>
<td>15</td>
<td>6</td>
<td>W</td>
<td>Sep 23</td>
<td>5.1-2</td>
<td>15</td>
<td>Rigid Body FBDs</td>
<td>13</td>
</tr>
<tr>
<td>16</td>
<td>6</td>
<td>F</td>
<td>Sep 25</td>
<td>5.3-4</td>
<td>16</td>
<td>2D Equilibrium</td>
<td>14</td>
</tr>
<tr>
<td>17</td>
<td>6</td>
<td>M</td>
<td>Sep 28</td>
<td>5.3-4</td>
<td>17</td>
<td>3D Equilibrium</td>
<td>15</td>
</tr>
<tr>
<td>18</td>
<td>6</td>
<td>W</td>
<td>Sep 30</td>
<td>5.5-6</td>
<td>18</td>
<td>Free body diagrams, Equilibrium</td>
<td>16</td>
</tr>
<tr>
<td>19</td>
<td>6</td>
<td>F</td>
<td>Oct 02</td>
<td>5.7</td>
<td>19</td>
<td>Constraints</td>
<td>17</td>
</tr>
<tr>
<td>20</td>
<td>8</td>
<td>M</td>
<td>Oct 05</td>
<td>6.1-2</td>
<td>20</td>
<td>Trusses- Method of Joints</td>
<td>18</td>
</tr>
<tr>
<td>21</td>
<td>8</td>
<td>W</td>
<td>Oct 07</td>
<td>6.3</td>
<td>21</td>
<td>ZFMs</td>
<td>19</td>
</tr>
<tr>
<td>22</td>
<td>9</td>
<td>F</td>
<td>Oct 09</td>
<td>6.4</td>
<td>22</td>
<td>Trusses- Method of Sections</td>
<td>20</td>
</tr>
<tr>
<td>23</td>
<td>9</td>
<td>M</td>
<td>Oct 12</td>
<td>6.6</td>
<td>23</td>
<td>Frames</td>
<td>21</td>
</tr>
<tr>
<td>24</td>
<td>9</td>
<td>W</td>
<td>Oct 14</td>
<td>6.6</td>
<td>24</td>
<td>Machines</td>
<td>22</td>
</tr>
<tr>
<td>25</td>
<td>9</td>
<td>F</td>
<td>Oct 16</td>
<td>7.1</td>
<td>25</td>
<td>Internal Forces, Moments</td>
<td>23</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>M</td>
<td>Oct 19</td>
<td>-</td>
<td>-</td>
<td>EXAM II</td>
<td>-</td>
</tr>
<tr>
<td>26</td>
<td>10</td>
<td>W</td>
<td>Oct 21</td>
<td>7.2</td>
<td>26</td>
<td>V, M Diagrams</td>
<td>24</td>
</tr>
<tr>
<td>27</td>
<td>10</td>
<td>F</td>
<td>Oct 23</td>
<td>7.2</td>
<td>27</td>
<td>V, M Diagrams</td>
<td>25</td>
</tr>
<tr>
<td>28</td>
<td>11</td>
<td>M</td>
<td>Oct 26</td>
<td>7.3</td>
<td>28</td>
<td>Relations between Internal Forces</td>
<td>26</td>
</tr>
<tr>
<td>29</td>
<td>11</td>
<td>W</td>
<td>Oct 28</td>
<td>8.1-2</td>
<td>29</td>
<td>Friction</td>
<td>27</td>
</tr>
<tr>
<td>30</td>
<td>11</td>
<td>F</td>
<td>Oct 30</td>
<td>8.1-2</td>
<td>30</td>
<td>Friction</td>
<td>28</td>
</tr>
<tr>
<td>31</td>
<td>12</td>
<td>M</td>
<td>Nov 02</td>
<td>8.1-2</td>
<td>31</td>
<td>Friction</td>
<td>29</td>
</tr>
<tr>
<td></td>
<td>12</td>
<td>W</td>
<td>Nov 04</td>
<td>-</td>
<td>-</td>
<td>EXAM III</td>
<td>-</td>
</tr>
<tr>
<td>32</td>
<td>12</td>
<td>F</td>
<td>Nov 06</td>
<td>9.1</td>
<td>32</td>
<td>Center of Gravity, Centroids</td>
<td>30</td>
</tr>
<tr>
<td>33</td>
<td>13</td>
<td>M</td>
<td>Nov 09</td>
<td>9.2</td>
<td>33</td>
<td>Center of Gravity, Composite Bodies</td>
<td>-</td>
</tr>
<tr>
<td>34</td>
<td>13</td>
<td>W</td>
<td>Nov 11</td>
<td>10.1</td>
<td>34</td>
<td>Moment of Inertia</td>
<td></td>
</tr>
<tr>
<td>35</td>
<td>14</td>
<td>F</td>
<td>Nov 13</td>
<td>10.2</td>
<td>35</td>
<td>Parallel-Axis Theorem for an Area</td>
<td>31</td>
</tr>
<tr>
<td>36</td>
<td>14</td>
<td>M</td>
<td>Nov 16</td>
<td>10.4</td>
<td>36</td>
<td>Moment of Inertia, Composite Bodies</td>
<td>32</td>
</tr>
<tr>
<td>37</td>
<td>14</td>
<td>W</td>
<td>Nov 18</td>
<td>-</td>
<td>-</td>
<td>FINAL PROJECT</td>
<td>-</td>
</tr>
<tr>
<td></td>
<td>15</td>
<td>M</td>
<td>Nov 20</td>
<td>-</td>
<td>-</td>
<td>FINAL EXAM, 8:00am-10:00am</td>
<td>-</td>
</tr>
</tbody>
</table>
17: End Notes: Complete Hyperlinks From Syllabus

1 https://blackboard.angelo.edu/
2 https://www.angelo.edu/covid-19/returning-to-campus/health-and-safety.php
3 https://blackboard.angelo.edu/
5 http://www.angelo.edu/services/registrars_office/final.php
6 http://www.angelo.edu/student-handbook/
7 http://www.angelo.edu/catalogs/
8 http://www.angelo.edu/services/disability-services/
9 http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of
10 http://www.angelo.edu/content/files/14197-op-1011-grading-procedures
11 http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php
12 http://www.angelo.edu/dept/writing_center/academic_honesty.php