ENGR 2318: Economics and Sustainability of Infrastructure  
Section 010, Online, Fall 2020

1: Instructor
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Office: VIN 266

2: Required materials
• Required technology equipment and services:
  o A computer with a webcam and microphone
  o Highspeed internet access
• Required text materials (all available online without fees):

3: Prerequisites
• Math 1314

4: Course Description
Principles of sustainable development as they apply to engineering systems. In this course, students will work in teams to study an engineering system of their choice. They will learn and apply principles of sustainable energy, materials, and economic in a systems approach to developing a sustainable solution for their chose problem (3 credit hours with 3 Lecture hours per week.)

5: Student Learning Outcomes
When you complete this course, you should be able to:
1. Develop a personal definition of Sustainable Development and describe the engineer's responsibility in the process
2. Explain the characteristics of systems thinking and why it's essential to sustainable development
3. Describe the principles of sustainable energy systems and sustainable materials
4. Perform life cycle financial analyses of an engineering system
5. Within a team, perform a sustainability assessment of an engineering system and make recommendation for its sustainable development

6: Course outcome mapping
The mapping of the course outcomes to the ABET Criterion 3 student outcomes is shown in Table 1.
<table>
<thead>
<tr>
<th>ABET Criterion 3</th>
<th>Student Learning Outcome Number</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Solve Problems</td>
<td>1</td>
</tr>
<tr>
<td>2. Design</td>
<td>1</td>
</tr>
<tr>
<td>3. Communication</td>
<td>1</td>
</tr>
<tr>
<td>4. Ethics &amp; Professionalism</td>
<td>1</td>
</tr>
<tr>
<td>5. Teamwork</td>
<td>1</td>
</tr>
<tr>
<td>6. Experimentation</td>
<td>1</td>
</tr>
<tr>
<td>7. Acquire New Knowledge</td>
<td>1</td>
</tr>
</tbody>
</table>

**7: Course Structure and Communications**

This is an online course. There will be no scheduled synchronous meetings or lectures for the entire class. There will be a weekly schedule of assignments and deliverables. Students will be expected to work in teams to meet the learning outcomes and complete the course project. There will be individual assessments of students’ knowledge. Students will need access to a computer with a webcam and microphone and will need highspeed internet connectivity to complete the course.

**7.1: Communications**

Communication with your instructor and among other students will be through the following systems:

- **Blackboard (Bb):** All course materials and assignments will be delivered through Bb. Your instructor will post announcements on Bb. Class-wide discussions of materials will be on the Bb Discussion board. Project teams will be assigned a group collaboration area on Bb which they may use to manage their group work.

- **Email:** You may contact your instructor via email. You should use your university email and include your CID number in your email. Your instructor will respond to student emails sent from a university email address within 4 hours if they are received between 8:00 am – 8:00 pm M-F.

- **GroupMe:** You may text your instructor via GroupMe. Your instructor will respond to GroupMe texts within 2 hours from 8:00 am – 8:00 pm M-F and 7:00 – 10:00 pm Sundays. To join the course GroupMe scan the following QR code

![QR Code](image)

- **Gradescope:** Some of your online graded material will be submitted and graded through Gradescope. You will need to be able to generate pdf copies of your work to submit them via Gradeccope.

- **Google Drive:** Your team will be required to create a Google Drive folder and work within this folder when preparing project submittals. You must invite all team members and your instructor to join your Google Drive.

- **Online Webex Team Meetings:** You team will meet synchronously with your instructor several times during the semester. These meetings will take place via Webex.

**7.2: Typical Weekly Course structure**

Most weeks will start with a posting of assigned reading and video material on Sundays along with a starter discussion thread. You are expected to read and watch the assigned materials and take notes. After
completing the assigned readings and videos you are expected to make a thoughtful post to the discussion thread for the week by the end of the day on Tuesday. By the end of the day on Thursday, you are expected to post replies to the original posts of your fellow students. There will be an end of the week exercise due on Saturdays.

7.3: Course project

Starting several weeks into the course each student will join a team of 4 to 5 students to complete the course project. The project will be comprehensive in nature and require research outside of the assigned course readings. Students will pick their own project topics and team members with the guidance and approval of your instructor.

8: 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.

9: Graded Material

9.1: Reading Quizzes

After most reading or video assignments, you will be required to take a short quiz designed to 1) ensure timely completion of the reading or video and 2) test your knowledge of the assigned material. These quizzes are individual assignments.

9.2: Online Participation

You are expected to contribute to all online discussions including posting your original material and responding to material posted by your fellow students.

9.3: Weekly Exercises

At the end of each week you will be required to submit an exercise demonstrating your understanding of the learning outcome for the week. These exercises may be individual or group exercises.

9.4: Course Project

You will be required to complete a major project related to sustainable development as the culminating experience for this class. This project will require you to define a significant engineering problem, identify the system in which the problem is enclosed, perform a system level analysis of the problem, and generate a sustainable approach to solving the problem. You will be able to define your own problem and establish your own teams with the guidance and approval of your instructor. Teams will include 4 or 5 students.

9.5: Exams

There will be two exams during the course. The exams are individual exercises. There is no final exam.
9.6: **Grades: Weighting and Letter Grades**

The weighting system shown in Table 2 will be used in determining final grades for the course.

<table>
<thead>
<tr>
<th>Item</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Reading Quizzes</td>
<td>10%</td>
</tr>
<tr>
<td>Online Participation</td>
<td>20%</td>
</tr>
<tr>
<td>Weekly Exercises</td>
<td>20%</td>
</tr>
<tr>
<td>Exams</td>
<td>20%</td>
</tr>
<tr>
<td>Project</td>
<td>30%</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td>100%</td>
</tr>
</tbody>
</table>

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

A = excellent work  
B = good work  
C = average work  
D = poor work  
F = failing work

10: Classroom and University Policies and Student Support

10.1: General Policies

All students are required to follow the policies and procedures presented in the Angelo State University Student Handbook¹ and Angelo State University Catalog².

10.2: 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 website³. 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

10.3: Title IX Statement

Angelo State University is committed to providing and strengthening an educational, working, and living environment where students, faculty, staff, and visitors are free from sex discrimination of any kind. In accordance with Title VII, Title IX, the Violence Against Women Act (VAWA), the Campus Sexual Violence Elimination Act (SaVE), and other federal and state laws, the University prohibits discrimination based on sex, which includes pregnancy, and other types of Sexual Misconduct. Sexual Misconduct is a broad term encompassing all forms of gender-based harassment or discrimination and unwelcome behavior of a sexual nature. The term includes sexual harassment, nonconsensual sexual contact, nonconsensual sexual intercourse, sexual assault, sexual exploitation, stalking, public indecency, interpersonal violence (domestic violence or dating violence), sexual violence, and any other misconduct based on sex.
You are encouraged to report any incidents involving sexual misconduct to the Office of Title IX Compliance and the Director of Title IX Compliance/Title IX Coordinator, Michelle Boone, J.D. You may submit reports in the following manner:

Online: Incident Reporting Form Email:michelle.boone@angelo.edu
Phone: 325-942-2022  Face to face: Mayer Administration Building, Room 210

Note, as a faculty member at Angelo State, I am a mandatory reporter and must report incidents involving sexual misconduct to the Title IX Coordinator. Should you wish to speak to someone in confidence about an issue, you may contact the University Counseling Center (325-942-2371), the 24-Hour Crisis Helpline (325-486-6345), or the University Health Clinic (325-942-2171).

For more information about resources related to sexual misconduct, Title IX, or Angelo State’s policy please visit the: Title IX webpage.

10.4: 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.

10.5: 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.

10.6: Student Conduct Policies

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.

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.

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.

11: Modifications to the Syllabus

This class does not operate under democratic principles. Your instructor may change policies, procedures, of this course when he deems it necessary. In particular, the COVID-19 pandemic may require significant changes in course delivery and content on potentially short notice. You will be notified of any such changes.
12: Course Outline
The course outline is presented in Table 3. More detail and updates will be provided via Bb.

Table 3: Course Lesson Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Start Date</th>
<th>Topic</th>
<th>Project Milestones</th>
<th>Exams</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Module 1: Introduction</td>
<td></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Aug 17</td>
<td>Introduction</td>
<td></td>
<td></td>
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<tr>
<td>2</td>
<td>Aug 24</td>
<td>Sustainability Concepts</td>
<td></td>
<td></td>
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<tr>
<td>3</td>
<td>Aug 31</td>
<td>Systems Engineering</td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td>Module 2: Components of Sustainability</td>
<td></td>
<td></td>
</tr>
<tr>
<td>4</td>
<td>Sep 7</td>
<td>Sustainable Energy Systems</td>
<td>Team Agreement</td>
<td>Exam 1</td>
</tr>
<tr>
<td>5</td>
<td>Sep 14</td>
<td>Project Presentations: Scope and system boundaries</td>
<td>Project Proposal</td>
<td></td>
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<tr>
<td>6</td>
<td>Sep 21</td>
<td>Sustainable Water Systems</td>
<td></td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Sep 28</td>
<td>Sustainable Materials</td>
<td></td>
<td></td>
</tr>
<tr>
<td>8</td>
<td>Oct 5</td>
<td>Project Presentations: Causal Loop Analysis</td>
<td>Systems Analysis</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Module 3: Economic Analysis</td>
<td></td>
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<tr>
<td>9</td>
<td>Oct 12</td>
<td>Time value of money</td>
<td></td>
<td>Exam 2</td>
</tr>
<tr>
<td>10</td>
<td>Oct 19</td>
<td>Life cycle cost analyses</td>
<td></td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Oct 26</td>
<td>Project Presentations: Economic analysis</td>
<td>Economic Analysis</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>Module 4: Engineering Project Application</td>
<td></td>
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<tr>
<td>12</td>
<td>Nov 2</td>
<td>Project progress meetings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Nov 9</td>
<td>Project progress meetings</td>
<td></td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Nov 16</td>
<td>Final Project Presentations</td>
<td>Final Report</td>
<td></td>
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<tr>
<td></td>
<td></td>
<td>No final exam</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

13: End Notes

1 http://www.angelo.edu/student-handbook/
2 http://www.angelo.edu/catalogs/
3 http://www.angelo.edu/services/disability-services/
4 http://www.angelo.edu/incident-form
5 http://www.angelo.edu/title-ix
6 http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of
7 http://www.angelo.edu/content/files/14197-op-1011-grading-procedures
8 http://www.angelo.edu/student-handbook/community-policies/academic-integrity.php
9 http://www.angelo.edu/dept/writing_center/academic_honesty.php
10 http://www.texastech.edu/downloads/ttus-policy-face-coverings.pdf