1: Course Number and Name
   a. ENGR 2318: Economics and Sustainability of Infrastructure, Spring 2021
   b. Section - D10, Online

2: Credits and Contact Hours
   a. Credits: 3
   b. Contact Hours: -

3: Instructor Information
   a. Course Coordinator: William Kitch
   b. Instructors:
      i. Gustavo Vargas-Silva, 325-486-5540, gustavo.vargas-silva@angelo.edu. Office: VIN 270. For office hours see faculty homepage.
      ii. William Kitch, 325-486-5501, william.kitch@angelo.edu. Office: VIN 268. For office hours see faculty homepage.

4: Required Course Materials
   Readings will be posted on-line. You do not need to purchase a textbook. Following required text materials are all available online without fees:

5: Technology Requirements
   To successfully complete this course, you need the following technology equipment:
   o A computer with a webcam and microphone
   o Highspeed internet access

6: Specific Course Information
   a. Catalog 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.
   c. Prerequisites: Math 1314
   d. Required or elective: Required for the BSCE and BSME Majors.

7: Specific Goals for the Course
   a. Course Learning Outcomes:
      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

b. Course Learning Outcome Mapping to ABET Criterion 3 Student Outcomes:

Table 1: Course Learning Outcomes mapped to ABET Student Outcomes

<table>
<thead>
<tr>
<th>ABET Student Outcomes</th>
<th>1</th>
<th>2</th>
<th>3</th>
<th>4</th>
<th>5</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. Solve Problems</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
<td>X</td>
</tr>
<tr>
<td>2. Design</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>3. Communication</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>4. Ethics &amp; Professionalism</td>
<td>X</td>
<td>X</td>
<td>X</td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>5. Teamwork</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td>X</td>
</tr>
<tr>
<td>6. Experimentation</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>7. Acquire New Knowledge</td>
<td>X</td>
<td>X</td>
<td></td>
<td></td>
<td>X</td>
</tr>
</tbody>
</table>

8. Topics Covered

1. Introduction to Economics and Sustainability
2. Components of Sustainability
3. Economic Analysis
4. Engineering Project Application
9: Course Delivery and Communications

9.1: Delivery Method(s)
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.

9.2: 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 – 5:00 pm M-F.
- **Gradescope:** Some of your online graded material could be submitted and graded through Gradescope. You will need to be able to generate PDF copies of your work to submit them.
- **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.

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;
9. recognize the classroom as a professional workplace.

11: Graded Material

11.1: Typical Weekly Course structure
Most weeks will start with a posting of assigned reading and/or video material on Tuesdays. You are expected to read and/or watch the assigned materials and take notes. After completing the assigned readings and/or videos you are expected to make a thoughtful individual handwritten report to the topic of the week by the end of the day on Thursdays. There will be an end of the week exercise due on Fridays.

11.2: Homework (Watching Assignments)
Every week you will be given a documentary film to watch as homework assignments. All watching assignments are available online without fees on Kanopy, streaming platform offering movies,
documentaries. Kanopy is free to all Tom Green County Library System card holders in good standing. Visit the following link to access their public material: http://www.tgclibrary.com/streamingmovies.asp

Homework should be solved handwritten and be turned-in by the end of the day on Thursdays in a PDF format.

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.

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.

11.3: Weekly exercises

At the end of each week (on Fridays) you will be given an exercise demonstrating your understanding of the learning outcome for the week. These exercises are individual assessments.

11.4: 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 choose your problem (from a list provided by your instructor) and the teams will be defined by your instructor. Teams will include 3 or 4 students.

11.5: Exams

There will be no exams during the course.

11.6: Grades: Weighting and Letter Grades

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

Table 2: Grade Weighting

<table>
<thead>
<tr>
<th>Item</th>
<th>Percent</th>
</tr>
</thead>
<tbody>
<tr>
<td>Homework</td>
<td>10%</td>
</tr>
<tr>
<td>Weekly exercises</td>
<td>30%</td>
</tr>
<tr>
<td>Project</td>
<td>60%</td>
</tr>
<tr>
<td>Total</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
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.

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. 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 www.angelo.edu/incident-form. 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: www.angelo.edu/title-ix.
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.

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 or SafeAssign. 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.

13: **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 Bb. The following schedule may be modified as the semester progresses.
Table 3: Course Lesson Outline

<table>
<thead>
<tr>
<th>Week</th>
<th>Start Date</th>
<th>Topic</th>
<th>Project Milestones</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td><strong>Module 1: Introduction</strong></td>
<td></td>
</tr>
<tr>
<td>1</td>
<td>Jan 25</td>
<td>Introduction</td>
<td></td>
</tr>
<tr>
<td>2</td>
<td>Feb 01</td>
<td>Sustainability Concepts</td>
<td></td>
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<tr>
<td>3</td>
<td>Feb 08</td>
<td>Systems Engineering</td>
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<td></td>
<td></td>
<td><strong>Module 2: Components of Sustainability</strong></td>
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<tr>
<td>4</td>
<td>Feb 15</td>
<td>Sustainable Energy Systems</td>
<td></td>
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<tr>
<td>5</td>
<td>Feb 22</td>
<td>Project Presentations: Scope and system boundaries</td>
<td></td>
</tr>
<tr>
<td>6</td>
<td>Mar 01</td>
<td>Sustainable Water Systems</td>
<td></td>
</tr>
<tr>
<td>7</td>
<td>Mar 08</td>
<td>Sustainable Materials</td>
<td></td>
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<tr>
<td>8</td>
<td>Mar 15</td>
<td>Project Presentations: Causal Loop Analysis</td>
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<tr>
<td></td>
<td></td>
<td><strong>Module 3: Economic Analysis</strong></td>
<td>Economic Analysis</td>
</tr>
<tr>
<td>9</td>
<td>Mar 22</td>
<td>Time value of money</td>
<td></td>
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<tr>
<td>10</td>
<td>Mar 29</td>
<td>Life cycle cost analyses</td>
<td></td>
</tr>
<tr>
<td>11</td>
<td>Apr 05</td>
<td>Project Presentations: Economic analysis</td>
<td>Economic Analysis</td>
</tr>
<tr>
<td></td>
<td></td>
<td><strong>Module 4: Engineering Project Application</strong></td>
<td></td>
</tr>
<tr>
<td>12</td>
<td>Apr 12</td>
<td>Project progress meetings</td>
<td></td>
</tr>
<tr>
<td>13</td>
<td>Apr 19</td>
<td>Project progress meetings</td>
<td></td>
</tr>
<tr>
<td>14</td>
<td>Apr 26</td>
<td>Project progress meetings</td>
<td></td>
</tr>
<tr>
<td>15</td>
<td>May 03</td>
<td>Final Project Presentations</td>
<td>Final Report</td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td>No final exam</td>
</tr>
</tbody>
</table>

14: End Notes

2 [http://www.angelo.edu/catalogs/](http://www.angelo.edu/catalogs/)
3 [http://www.angelo.edu/services/disability-services/](http://www.angelo.edu/services/disability-services/)
4 [http://www.angelo.edu/incident-form](http://www.angelo.edu/incident-form)
5 [http://www.angelo.edu/title-ix](http://www.angelo.edu/title-ix)
6 [http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of](http://www.angelo.edu/content/files/14206-op-1019-student-absence-for-observance-of)
7 [https://www.angelo.edu/content/files/14197-op-1011-grading-procedures](https://www.angelo.edu/content/files/14197-op-1011-grading-procedures)
9 [http://www.angelo.edu/dept/writing_center/academic_honesty.php](http://www.angelo.edu/dept/writing_center/academic_honesty.php)