Engineering Communications and Societal Integration (ENGR 301)

Syllabus and Handbook

Summer 2017
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Course Description
ENGR 301 Engineering Communications and Societal Integration (3+0) 3 credits; course is for credit only. ENGR 301 is designated as a service learning course; completion of service learning activity and associated forms are required.

Researching and applying science and technology in societal context; integrating and synthesizing knowledge; communicating information and knowledge via oral, written, and visual presentation. Course must be taken in residence; substitutions or waivers are not permitted.

Prerequisites: ENG 102 and PHYS 181 with a "C" or better; CH 201 or 202; CH 203; junior or senior standing

Satisfies: Core Capstone; CO9 (Science, Technology, & Society); CO13 (Integration & Synthesis); ABET Criteria a, b, d, f, g, h, i, and j.

Instructor
Candice Bauer, Ph.D.
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E-mail Address: cbauer@unr.edu (please include ENGR 301 in the subject line)

Teaching Assistant
Gabrielle Bachand
E-mail Address: engr301@gmail.com
Office: SEM 131 Foyer
Office hours: Please see FAQs on website

Required Course Material and Resources
Website: http://wolfweb.unr.edu/~cbauer/engr301/
No textbook is required.
Folders: SEM 131 Foyer
Required course material: computer, printer, and internet access; Microsoft Office; team meetings and classroom visits outside of specific class time; USB drive; camera; note taking materials; PDF reader; professional attire; project supplies as determined by student team; photo identification
**Student Learning Objectives**

*Core Objective 9 (Science, Technology, & Society):* Students will be able to connect science and technology to real-world problems by explaining how science relates to problems of societal concern; be able to distinguish between sound and unsound interpretations of scientific information; employ cogent reasoning methods in their own examinations of problems and issues; understand the applications of science and technology in societal context.

1. Students will be able to apply knowledge of mathematics, science, and engineering. [integrates CO2; CO3]
   a. Students will explain how science relates to a problem of societal concern.
2. Students will be able to design and conduct experiments as well as to interpret data. [integrates CO2; CO3]
   a. Students will distinguish between sound and unsound interpretations of scientific information.
3. Students will have a knowledge of contemporary issues. [integrates CO11]
   a. Students will identify the societal impacts of contemporary issues (such as sustainability, energy problems, water quality, and information science).
4. Students will have the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context. [integrates CO11]
   a. Students will employ cogent reasoning methods in their own examinations of problems and issues.
   b. Students will describe how scientific and technological developments affect society and the environment.
   c. Students will integrate, synthesize, and apply knowledge of the relationship between science and technology and societal issues in both focused and broad interdisciplinary contexts.

*Core Objective 13 (Integration & Synthesis):* Students will be able to integrate and synthesize Core knowledge, enabling them to analyze open-ended problems or complex issues.

5. Students will be able to function in a multi-disciplinary team. [integrates CO1]
6. Students will have an understanding of professional and ethical responsibility. [integrates CO12]
   a. Students will identify and analyze the scientific debates and ethical concerns.
   b. Students will identify the multiple ethical interests at stake in a real-world situation or practice.
   c. Students will articulate what makes a particular course of action ethically defensible.
   d. Students will assess their own ethical values and the social context of problems.
   e. Students will identify ethical concerns in research including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects.
   f. Students will demonstrate knowledge of ethical values in non-classroom activities: service learning.
   g. Students will integrate, synthesize, and apply knowledge of ethical dilemmas and resolutions in academic settings, including focused and interdisciplinary research.
7. Students will be able to communicate effectively. [integrates CO1]
8. Students will have a recognition of the need for, and an ability to engage in life-long learning.
Semester Project and Course Deliverables
Students will be placed into groups of three or four. They will be responsible for developing a design contest or project for elementary, middle, or high school students to teach them an engineering and scientific principle. As part of the service learning criteria, students will be required to visit a K-12 classroom to conduct their project. Students will give a technical briefing, a proposal report and presentation, a final project review report and presentation, documentation of professional development, impromptu improvements, and Core Capstone Defense report and presentation.

All assignments must be in hardcopy and typed. All rough drafts must also be in hardcopy.

Attendance and Late Policies
Attendance to all classes is required. If the teaching team is notified via phone or e-mail one week prior (or 24 hours if due to a medically related incident) to an absence, the teaching team will attempt to make reasonable accommodation which may include requiring the student to attend an alternative lab session or submit make-up assignments (no more than two accommodations can be requested). If reasonable accommodations cannot be made, zero points will be awarded for the corresponding assignment. If the absence occurs on a scheduled deadline, no accommodations will be made and will result in zero points being awarded for that assignment. Additionally, if there is more than one absence, failure in the course may result.

On-time arrival to class is required. If the teaching team is notified via phone or e-mail one week prior to a late arrival, the teaching team will attempt to make reasonable accommodation which may include requiring the student to attend an alternative lab session or submit make-up assignments (no more than two accommodations can be requested). More than two late arrivals may result in course grade reductions of five points for each subsequent incident.

Leaving class before being dismissed will be documented as an absence and may negate the grades earned for that class period.

Leaving class and returning is considered disruptive and will be documented as unprofessional behavior negating the grades earned for that class period. Excessive disturbances will result in course failure.

Late assignments will not be accepted. Students are encouraged to submit material for major written assignments early. Medical, transportation, work obligation, family obligations, or other excuses will not be accepted for major assignments.

All major deadlines are defined herein; thus, deadline extensions are not available for any assignment for any reason.
Course Schedule
The schedule for major due dates is in Table 1. Unless otherwise stated, assignments are due at the beginning of class. Impromptu assignments have various due dates which are not listed; students are required to properly document impromptu assignment due dates and will be held responsible for noting the discussion of those assignments during class. “4:00 p.m. to SEM 131” indicates that material is due no later than 4:00 p.m. to the assigned folders or boxes as instructed in the foyer of SEM 131; early submission is encouraged. The foyer of SEM 131 is only open during normal business hours; students should make plans to pick up and drop off material during appropriate operating hours.

Table 1: Students should record and observe all major due dates as alternative dates cannot be accommodated.

| May 22    | Forms                        |
| May 24    | Technical briefing           |
| May 31    | Rough draft of proposal written report |
| June 1    | Proposal presentation and handout |
| June 1 (4:00 p.m. to SEM 131) | Final draft of proposal written report and form |
| June 7    | Service learning project field day* |
| June 8    | White Paper                  |
| June 13   | ENGR Idol presentation       |
| June 14   | Rough draft of final review written report |
| June 15   | Final review presentation and handout |
| June 15 (4:00 p.m. to SEM 131) | Final draft of final review written report and forms |
| June 19   | Core Capstone Defense written revised draft |
| June 19 (4:00 p.m. to SEM 131) | Professional development |
| June 20   | Core Capstone Defense (written and oral) |
| June 22   | Final Exam                   |

*Failure to attend the service learning project field day (classroom visit) will result in course failure. There are no exceptions. If medically related, students are encouraged to go to the hospital to obtain proper documentation to seek a medical withdrawal from the course.
Grading Criteria
The grading criteria is shown in Table 2. All grade disputes must be addressed prior to 4:00 p.m. on May 21. Grading errors will be corrected; however, unprofessional behavior including grade bargaining, begging, negotiating, and haggling will not be tolerated and may result in a reduction of the final course grade. Seeking a grade change based on contentions (such as needing a better grade for scholarships) other than a documented error is considered a violation of this policy. The amount of effort or time dedicated to an assignment are invalid contentions for seeking a grade increase. No extra credit is available.

Table 2: The grading criteria illustrates the point-by-point grading system for each assignment.

<table>
<thead>
<tr>
<th>Element</th>
<th>Maximum Points</th>
</tr>
</thead>
<tbody>
<tr>
<td>Impromptu Improvements</td>
<td>20.0</td>
</tr>
<tr>
<td>Professional Development</td>
<td>10.0</td>
</tr>
<tr>
<td>Technical Briefing</td>
<td>5.0</td>
</tr>
<tr>
<td>Proposal Presentation</td>
<td>10.0</td>
</tr>
<tr>
<td>Proposal Written Report</td>
<td>10.0</td>
</tr>
<tr>
<td>White Paper</td>
<td>10.0</td>
</tr>
<tr>
<td>Final Review Presentation</td>
<td>15.0</td>
</tr>
<tr>
<td>Final Review Written Report</td>
<td>15.0</td>
</tr>
<tr>
<td>Final Exam</td>
<td>5.0</td>
</tr>
<tr>
<td>Core Capstone Defense Presentation</td>
<td>50.0</td>
</tr>
<tr>
<td>Core Capstone Defense Report</td>
<td>50.0</td>
</tr>
<tr>
<td>TOTAL</td>
<td>200.0</td>
</tr>
</tbody>
</table>

Grading Scale
The grading scale is shown in Table 3. The point system should not be converted into percentages; due to the large pass or fail quantity, a conversion is not an accurate representation of grade requirements.

Table 3: A standard grading scale based on 200.0 points is used.

<table>
<thead>
<tr>
<th>Points</th>
<th>Grade Point Average (Letter Grade)</th>
</tr>
</thead>
<tbody>
<tr>
<td>200.0 to 194.0</td>
<td>4.0 (A)</td>
</tr>
<tr>
<td>193.9 to 190.0</td>
<td>3.7 (A-)</td>
</tr>
<tr>
<td>189.9 to 187.0</td>
<td>3.3 (B+)</td>
</tr>
<tr>
<td>186.9 to 184.0</td>
<td>3.0 (B)</td>
</tr>
<tr>
<td>183.9 to 180.0</td>
<td>2.7 (B-)</td>
</tr>
<tr>
<td>179.9 to 177.0</td>
<td>2.3 (C+)</td>
</tr>
<tr>
<td>176.9 to 174.0</td>
<td>2.0 (C)</td>
</tr>
<tr>
<td>173.9 to 170.0</td>
<td>1.7 (C-)</td>
</tr>
<tr>
<td>169.9 to 167.0</td>
<td>1.3 (D+)</td>
</tr>
<tr>
<td>166.9 to 160.0</td>
<td>1.0 (D)</td>
</tr>
<tr>
<td>159.9 to 0.0</td>
<td>0.0 (F)</td>
</tr>
</tbody>
</table>
**Academic Dishonesty:** Cheating, plagiarism, or otherwise obtaining grades under false pretenses constitute academic dishonesty according to the code of this University. Cheating includes using the work of another author, family member, or student. Using material prepared by anyone other than the enrolled student is cheating (e.g., the use of “frat files” is considered cheating). Plagiarism includes copying words, figures, or data from another author without properly citing the source or using proper notation and formatting. Failure to attend the classroom visit or team meetings while submitting associated assignments constitutes academic dishonesty. Academic dishonesty will not be tolerated and penalties can include canceling a student’s enrollment without a grade, giving an F for the course, or giving an F for the assignment. An objective of this course is to learn professional, ethical, and respectful behavior. Regardless of credit earned on assignments, failure to adhere to the Student Code of Conduct or the learning objectives may result in course failure. The UNR General Catalog details these policies.

**Disability Services:** Any student with a disability needing academic adjustments or accommodations is requested to visit the Disability Resource Center (Pennington Student Achievement Center, Suite 230) as soon as possible to arrange for appropriate accommodations.

**Academic Success Services:** Student fees include the usage of the Math Center (784-4433 or www.unr.edu/mathcenter/), Tutoring Center (784-6801 or www.unr.edu/tutoring/), and University Writing Center (784-6030 or http://www.unr.edu/writing_center/). These centers support classroom learning; it is your responsibility to take advantage of their services. Keep in mind that seeking help outside of class is the sign a responsible and successful student.

**Audio and Video Recording:** Surreptitious or covert video-taping of class or unauthorized audio recording of class is prohibited by law and by Board of Regents policy. This class may be videotaped or audio recorded only with the written permission of the instructor. In order to accommodate students with disabilities, some students may have been given permission to record class lectures and discussions. Therefore, students should understand that their comments during class may be recorded.

**General Requirements:** Office hours are designed for supplemental instruction and learning. Office hours are not designed for full technical edits nor “pre-grading.” Advice given during office hours is in no way considered complete nor a guarantee of a specific grade.

Students are expected to behave as professionals both inside and outside of the classroom. Teammates are to be treated professionally and respectfully during all interactions. While in class, students are expected to refrain from cell phone use, playing video games, engaging in side conversations, and other behavior that is disruptive to the learning process. Students are expected to take notes, learn the material, and be prepared for class. Students are expected to manage their time appropriately.

Students are expected to behave professionally while in the foyer of SEM 131. SEM 131 is a place of business. Students should speak quietly, should not create a congested area, should not use offensive language, should not have “temper tantrums,” and should not ask office staff for office supplies.

Material subject to change.
Student Learning Objectives

Student learning objectives (SLOs) are the goals set by the teacher of a course to communicate what students should learn. Accreditation bodies use SLOs to ensure that universities are teaching what is claimed and that students are learning. The programs within the College of Engineering are required to conform to the accreditation requirements of ABET (Accreditation Board of Engineering and Technology) and Northwest Commission on Colleges and Universities. These entities, along with the University of Nevada, Reno Silver Core Curriculum Board, have defined specific SLOs. ENGR 301 is designed as a Core Capstone class. As a Core Capstone, the course must integrate specific Core Objectives (CO). The following will detail the SLOs, their relationship to the COs, and how the lesson plans address the SLOs.

Silver Core SLOs Relevant to ENGR 301

CO1: (Effective Composition & Communications) Students will be able to effectively compose written, oral, and multimedia texts for a variety of scholarly, professional, and creative purposes.

CO2: (Quantitative Reasoning) Students will be able to apply quantitative reasoning and mathematical analysis methodologies to understand and solve problems.

CO3: (Critical Analysis & Use of Information) Students will be critical consumers of information, able to engage in systematic research processes, frame questions, read critically, and apply observational and experimental approaches to obtain information.

CO9: (Science, Technology, & Society) Students will be able to connect science and technology to real-world problems by explaining how science relates to problems of societal concern; be able to distinguish between sound and unsound interpretations of scientific information; employ cogent reasoning methods in their own examinations of problems and issues; and understand the applications of science and technology in societal context.

CO11: (Global Context) Students will apply and evaluate modes of academic inquiry, creative expression, or results of research to problems in historical and contemporary global contexts. Students will articulate connections among local, national, and international contexts and evaluate the ways that historical and contemporary global influences affect their current situations.

CO12: (Ethics) Students will demonstrate understanding of the ethical principles in general or in application of specialized knowledge, results of research, creative expression, or design processes. Students will demonstrate an ability to recognize, articulate, and apply ethical principles in various academic, professional, social, or personal contexts.

CO13: (Integration & Synthesis) Students will be able to integrate and synthesize Core knowledge, enabling them to analyze open-ended problems or complex issues.
ABET Criteria Relevant to ENGR 301

Students will have

a. an ability to apply knowledge of mathematics, science, and engineering.
b. an ability to design and conduct experiments, as well as to interpret data.
d. an ability to function in a multi-disciplinary team.
f. an understanding of professional and ethical responsibility.
g. an ability to communicate effectively.
h. the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
i. a recognition of the need for, and an ability to engage in life-long learning.
j. a knowledge of contemporary issues.

Student Learning Objectives (SLOs) for ENGR 301

The Student Learning Objects for ENGR 301 are detailed on Page 2.

Lesson Plans as Related to Student Learning Objectives

Introduction [CO1; CO9; CO13; ABET f & i; SLO 6 & 8]

Students learn about the course syllabus and classroom management policies. Professional decorum (such as “no call, no show is grounds for termination”) is related between class policies and societal expectation of behavior. Students learn that the skills that they have obtained will be further developed, integrated, and synthesized.

Project Discussion, Grammar, and Writing Skills [CO1; CO12; CO13; ABET f, g, & h; SLO 4, 6, & 7]

Students learn to reduce common grammatical errors which includes real-life examples and a review of the course grading rubric. Students learn the unique characteristics of writing technical content and using technical writing practices (such as “de-fluffing” their writing to be clear, precise, and concise). Students learn best practices for readability and techniques to ensure that both technical and non-technical audiences can easily read and comprehend their writing. Previously developed core skills are integrated. Students learn to identify ethical concerns in research including academic integrity, use and citation of sources, and the objective presentation of data.

Networking [CO1; CO9; CO13; ABET d, f, g, & i; SLO 5, 6, 7, & 8]

Students learn techniques to “break the ice” in a variety of situations. The goal is to establish both a technical and personal connection in order to develop trusting and understanding relationships with members in society. The students learn techniques to discuss highly technical and scientific concepts in relatable ways. Previously developed core skills are integrated.

Speaking Skills [CO1; ABET g; SLO 7]

Students learn the elements of general speaking and presentation skills: professional attire (expectations for engineers and scientists conducting business within society); poise and posture (to illustrate confidence in material being presented and gain trust with audience); pace, tone, and articulation (to ensure high energy and enthusiastic style); techniques to ensure coherency and understanding when delivering highly technical content to diverse audiences.
Visual Aids [CO1; ABET g; SLO 7]
Students learn how to create high quality and effective visual aids. Students learn proper techniques for communicating data via graphs, figures, and tables in presentations to more effectively transmit the technical information to diverse audiences. Students also learn techniques of how to interpret data from graphs, figures, and tables. Students learn templates and techniques to organize their presentations coherently and effectively to best deliver technical content.

Audience Skills [CO1; CO9; CO13; ABET d & g; SLO 5 & 7]
Students take a test to determine what their learning style is. Then, students are separated so that they can all see that there are diverse learning styles, and the students learn that it is necessary to diversify one’s presentation to accommodate all learning styles. This lesson illustrates how to communicate science and technology to all of society. Previously developed core skills are integrated.

Technical Briefings [CO1; CO3; CO9; CO11; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]
Students are assigned to create a two-minute “elevator” presentation to communicate an engineering, scientific, or technology topic. The students are challenged to research that topic and relate its impact to society. Visual aids are required. Audience members are held accountable to pay attention to each presentation so that they are exposed to a wide variety of topics. Because the course is multidisciplinary, students learn about several topics. Further, the students make connections from previous coursework.

Grammar Quiz [CO1; ABET g]
Students are held accountable to having learned from the grammar workshop. Students engage in taking an individual quiz.

Proposal Skills [CO1; CO2; CO3; CO9; CO11; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]
The semester project is introduced. Students are assigned to develop a design project to teach K-12 students an engineering or scientific principle. The students then engage in researching the educational system in the U.S. They compare the education of STEM globally. In their research, they distinguish between sound and unsound interpretations of the data; students synthesize and analyze the data. They also have to develop their own problem statement, conduct research as to how others have addressed improving STEM education, and then they must apply their knowledge. As part of the service learning aspect of the course, the students visit a K-12 classroom and conduct the design project with those K-12 students. Students learn how to develop a problem statement, craft a design concept, perform a literature search, and manage the project. In performing a literature search, students understand the interaction among different disciplinary fields.

Abstracts [CO1; CO3; CO9; CO11; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]
Students learn how to develop a scientific abstract. Students select a topic in engineering, science, or technology as it relates to impacting society. The students draft an abstract to illustrate their understanding of that topic.

Team Building [CO1; CO9; CO11; CO12; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]
Students learn the stages of teams, how to resolve conflict, working with different personality types, understanding why and how a team achieves its objectives, knowing how to start a team, using tools like
decision matrices, and recognizing pitfalls in the team process. Additionally, students develop an understanding of the importance of teams in the scientific and engineering community. They learn how to work with non-scientists on their teams and how to relate content to them. Students learn how to interact in a global context by learning different cultures, ethical considerations, and work styles.

**Team Charter [CO1; CO12; CO13; ABET d, f, & g; SLO 5, 6, & 7]**

Students are instructed to draft a team charter which details the rules and consequences for poor team behavior. For example, if a student is late to a team meeting, that student must bring donuts for the teammates. The development and enforcement of the team charter relates the need to communicate professional decorum, ethical requirements, and expectations for all team members (those that are in scientific fields and those that are not). By interacting with their peers, the students learn to critically examine their own worldview and ethical values and how it interacts and impacts others.

**Brainstorming [CO1; CO9; CO13; ABET a & g; SLO 1 & 7]**

Students are asked to learn new directions. Then, they are quizzed on it. The exercise illustrates that preconceived notions are detrimental to the brainstorming process. Rules to help with the brainstorming process are then given. Brainstorming is a common practice for problem solving in society. Students learn these techniques so that they can properly communicate in a diverse workplace. Students also learn the benefit of using brainstorming to employ cogent reasoning methods in their own examinations of problems and issues. Students develop their ability to synthesize concepts and to critically examine their own perspective and how it impacts others.

**Effective Meetings [CO1; ABET d, f, g, & j; SLO 3, 5, 6, & 7]**

Students read a few scripts of bad meetings. They are then taught tools and techniques as well as their own responsibilities in a meeting to make it effective. Students learn the five pre-meeting questions to answer before calling a meeting: why should we have this meeting; what should we do; who really needs to be there; when will this take place; where is the meeting? Students apply these questions to the development of an objective and an agenda. Next, students learn the main pitfalls of meetings: aggression, repression, and tangents. They learn techniques to address these common conflicts in order to reunite the participants, keep the group moving forward, and refocus the group. Contemporary techniques for meetings are also explored. For example, students learn how to meet in non-face-to-face situations using tools like Skype, FaceTime, conference calls, online chats, and database sharing software.

**Listening [CO1; ABET g; SLO 7]**

Students learn techniques to eliminate poor listening habits. The students learn the need to show that they are actively listening and not passively hearing.

**Questioning Skills [CO1; CO3; ABET g; SLO 7]**

Students learn how to answer questions and how to ask effective questions. Students learn how to properly host a questions and answer session including how to control hecklers and deal with difficult situations. Students also learn that the way they ask the question is directly related to the answer that is received. Students learn how to ask strategic, creative, and open-ended questions.
Questions [CO1; CO3; CO9; CO13; ABET a, g, & h; SLO 1, 4, & 7]
Students are asked to define complex vocabulary into non-technical language.

Confetti Factory [CO1; CO9; CO12; CO13; ABET a, d, f, g, & h; SLO 1, 4, 5, 6, & 7]
Students are assigned a role that stereotypes typical corporate situations (such as a CEO that travels the majority of the time, a co-worker with poor communications skills, a micro-manager, a tyrant boss, a sleeping co-worker, etc.). The students are then challenged to produce confetti while playing the role to which they were assigned. A discussion on how each personality type or situational circumstance contributed to the destruction of the corporation ensues. The students learn techniques to prevent or to resolve such situations. The case study format allows students to apply theories from a variety of disciplines. Further, the format allows students to identify the multiple ethical interests at stake in a real-world situation.

Pause [CO1; CO9; CO13; ABET a, g, & j; SLO 1, 3, & 7]
Students learn techniques to reduce their number of fillers, how to recover if material is forgotten, and proper presentation techniques.

Team Presentation Skills [CO1; CO13; ABET d & g; SLO 5 & 7]
Students learn the special considerations that are needed to have an effective team presentation.

Peer Edit Proposals [CO1; CO2; CO3; CO9; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]
Rough drafts of the students’ written reports are due, and a peer edit session is hosted. The peer editing allows both for the review of grammar and format as well as the review of content. Reviewing the content of a peer’s work exposes the student again to the lessons addressed in “Proposal Skills.” Specifically, students learn how to distinguish between sound and unsound interpretations of scientific information as they review their peers’ conclusions. Students critically examine their peers’ work, and by identifying gaps in their peers’ work, the students show insight and gain new knowledge.

Proposal Presentations [CO1; CO2; CO3; CO9; CO11; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]
Each team delivers their presentation. In order to keep audience members engaged, each peer editor is responsible for asking their partner a question. It also ensures that each presenter receives a question and is able to practice that skill. The lessons of “Proposal Skills” are again re-enforced. Additionally, students are further exposed to the content developed by their peers as they learn more about connecting science and technology to real-world problems by learning how their peers relate science to problems of societal concern. They can compare their peers’ reasoning methods to their own in the examinations of problems and issues. Finally, students understand the applications of science and technology in societal context by being exposed and engaged with diverse perspectives of their peers.

Final Review Skills [CO1; CO2; CO3; CO9; CO11; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]
Students learn the requirements for the Design Review assignments. As part of the service learning aspect of the course, the students visit a K-12 classroom and conduct the design project with those K-12 students. The UNR students learn how to setup methods to evaluate their performance. The students then synthesize the experience and report their findings. By performing the service learning aspect, students directly observe how science and technology influence society. The assignment requires that students
identify and summarize current scholarly conversations both within their engineering field, in business, and in education.

Lab Reports & Documentation [CO1; CO2; CO3; CO9; CO12; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]
Students learn the aspects of doing documentation versus lab reports. Students learn to develop an abstract, criteria, testing procedure, observations, analysis, error analysis, and recommendations. Students learn both the legal and ethical implication of poor or inaccurate documentation. Students learn to identify ethical concerns in research by understanding the objective presentation of data. A game of Clue is played in which each student has a different clue / piece of data and must all eventually work together to solve the case. The game simulates and allows students to practice the ability to distinguish between sound and unsound interpretations of scientific information and employ cogent reasoning methods in their own examinations of problems and issues.

Experimental Design [CO1; CO2; CO3; CO9; CO12; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]
The steps to design an experiment are illustrated in connection to the semester project. Students learn how apply knowledge of the relationship between science and technology and societal issues in abroad interdisciplinary context. Specifically, the students learn how to design an experiment to assess their own performance in teaching K-12 students the principles of science, technology, and engineering. The students learn the techniques of using surveys and interviews to analyze how science, technology, and engineering affect society. The students also learn the ethical requirements to design experiments including not manipulating data and special considerations when working with human subjects.

Marketing [CO1; CO2; CO3; CO9; CO11; CO12; CO13; ABET a, d, f, g, h, & j; SLO 1, 3, 4, 5, 6, & 7]
Students learn marketing techniques by using group discussion and exercises. The students learn how science and technology are communicated and “sold” to society. They also learn the ethical and legal implications of miscommunicating the details or misdirecting the public in advertisements. Students learn that an important aspect of properly marketing products and services is to articulate ways in which society is can be transformed by that product or service of science and technology. Students engage in case studies where they learn about elements of technology that have changed cultures. International markets are also compared.

Budgets [CO1; CO2; CO3; CO9; CO12; CO13; ABET a, d, f, g, h, & j; SLO 1, 3, 4, 5, 6, & 7]
Students learn how to present budgets. They also learn how budgets impact the amount of service and safety they can deliver. Misappropriated budgets can lead to significant societial impacts. Students engage in case studies which show how when scientists and engineers make budget errors, the quality of projects can suffer (for example, if the amount of concrete is underestimated, the roadway could become unsafe). A discussion regarding the ethical and legal impact of underestimating or overestimating budgets ensues.

Instruction Manuals [CO1; CO3; CO9; CO13; ABET a, d, f, g, h, & j; SLO 1, 3, 4, 5, 6, & 7]
Students create a design and an instruction manual. The students learn how their scientific decisions can impact their audience.
Team Communication [CO1; CO2; CO3; CO9; CO11; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]
Students are held accountable to learning all aspects of the proposal and final review assignments. The lesson teaches the need to understand the project as a whole and how all the pieces fit together. The students also practice advanced presentation skills.

Legal & Security [CO1; CO3; CO9; CO11; CO12; CO13; ABET a, d, f, g, h, i, & j; SLO 1, 3, 4, 5, 6, 7, & 8]
Students learn how science, technology, and engineering have impacted legal and security issues. Additionally, students learn how legal and security issues have impacted science, technology, and engineering. These legal issues are related to the impact on society as a whole. Students conduct a case law analysis on science, technology, and engineering related court cases to learn how court decisions have impacted society. Students learn about manufacturing and design liability. They also learn the elements of contracts. Students learn case scenarios in which product safety was not held to the highest standards and resulted in deaths and injury. Legal and ethical considerations as they affect society are reviewed. International laws and ethics are also discussed. Students learn how to articulate what makes a particular course of action ethically and legally defensible.

White Paper [CO1; CO2; CO3; CO9; CO11; CO12; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]
The students research a contemporary issue in their field of engineering, technology, and science. They then develop a written report (white paper) to address the issue, impact on society, and recommendations. By developing both a problem statement (issue) and a recommendation, students learn to identify gaps in previous literature while developing new knowledge. In developing a recommendation, students are required to give consideration to the legal and ethical impact of the solution. The assignment also requires that students examine their worldview and how they developed their worldview. Finally, the students must identify and summarize contemporary scholarly exchanges within their field.

Field Week [CO1; CO2; CO3; CO9; CO11; CO12; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]
Students visit K-12 classrooms to try out their newly designed project which teach engineering, technology, and scientific principles. Students are also instructed to encourage the K-12 students into pursuing STEM related fields by illustrating how STEM affects society. The cliché that “to master something, one must teach it” is utilized in assignment. The students learn and teach how and why science, technology, and engineering affect society. (Note: K-12 Outreach Section further details components.)

Resumes and Interviews [CO1; ABET g & i; SLO 7 & 8]
A resume workshop is conducted where students bring in a rough draft of their resume and make corrections. Interview techniques are also reviewed. Students learn how to properly communicate their skills.

Non-verbal Communication & Impromptu Body Language [CO1; ABET g & j; SLO 3 & 7]
Students watch a series of videos to learn what experts have to say about non-verbal communication (aka, body language). The videos include an analysis of politicians and how their body language is analyzed. Videos also show the differences in cultures throughout the world. Then, the students get experience by
playing a game of charades where the whole audience tries to guess ridiculous phrases with pop culture content.

**Ethics Introduction [CO11; CO12; ABET f; SLO 6]**
The National Society of Professional Engineers’ Fundamental Canons of the Code of Ethics is introduced to the students. The students learn how to apply case scenarios to the Canons. The students engage in several case studies which illustrate how not applying the Code of Ethics in engineering, scientific, and technology decisions has caused devastating results in society. The students learn that as engineers, their number one obligation is to protect the health, safety, and welfare of society. Ethics is also reviewed in a global context. Students learn how to identify and analyze an ethical issue, to identify the multiple ethical interests at stake in a real-world situation, and to articulate what makes a particular course of action ethically defensible.

**Peer Edit Final Reviews [CO1; CO2; CO3; CO9; CO11; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]**
Rough drafts of their written reports are due, and a peer edit session is hosted. The peer editing allows both for the review of grammar and format as well as the review of content. Reviewing the content of a peer’s work exposes the student again to the lessons addressed in “Design Review Skills.” Specifically, students learn how to distinguish between sound and unsound interpretations of scientific information as they review their peers’ conclusions.

**Final Review Presentations [CO1; CO2; CO3; CO9; CO11; CO13; ABET a, b, d, f, g, h, i; & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]**
Each team delivers their presentation. In order to keep audience members engaged, each peer editor is responsible for asking their partner a question. It also ensures that each presenter receives a question and is able to practice that skill. The lessons of “Proposal Skills” are again re-enforced. The UNR students are able to compare how they setup methods to evaluate their performance versus how their peers’ approached the same problem. The students are exposed to the different techniques that their peers used to synthesize the experience and report their findings. Finally, the students are exposed to how their peers analyzed how science and technology influence society.

**Etiquette [CO1; CO11; CO9; CO12; CO13; ABET d, f, g, & h; SLO 4, 5, 6, & 7]**
Basic business etiquette is reviewed. Common questions about business lunches, political correctness, and international travel are addressed. Students learn how to respectfully communicate the principles of science, technology, and engineering by embracing differences in cultural and ethics. For example, students learn that in some cultures, working with religious and non-scientific leaders is of vital importance to bring in products and services.

**Idol [CO1; CO2; CO3; CO9; CO11; CO12; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]**
Modelled after American Idol, the students prepare a two-minute speech about a contemporary engineering, technology, or science topic. The students must identify a contemporary issue, develop a problem statement, illustrate the impact on society, and develop recommendations to solve the issue while giving consideration to the legal and ethical impact of the solution. Immediately after the speech, the instructor gives feedback. At the end, the whole class votes for whom their Idol is. This technique is used to ensure that the entire audience is actively engaged in listening and learning about all of these issues and impacts.
**Ethics [CO1; CO12; CO13; ABET d, f, & g; SLO 5, 6, & 7]**

Case study and scenario questions relate engineering, technology, and science to impacting society. By analyzing these case studies, students apply ethical theories to their field of study. Discussion for each question ensures that students assess their own ethical values in a societal context and compare their views with their colleagues and the Code of Ethics.

**Final Exam [CO1; CO2; CO3; CO9; CO11; CO12; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]**

The final exam is a one-minute impromptu speech regarding a topic learned in the course. The technique allows for instantaneous grading.

**Professional Development [CO1; CO9; CO13; ABET i & j; SLO 3 & 8]**

Students engage in life-long learning as they are required to participate in extra-curricular activities. For example, students attend meetings of professional societies, attend guest lectures or seminar, read journal papers or articles, and other such activities. Being exposed to non-classroom based science, engineering, and technology allows students to learn how these fields affect society and how society affects these fields.

**K-12 Outreach – Service Learning Component [CO1; CO2; CO3; CO9; CO11; CO12; CO13; ABET a, b, d, f, g, h, i, & j; SLO 1, 2, 3, 4, 5, 6, 7, & 8]**

In order to assist the strategic plan of K-12 Outreach, the course project is based on service learning. In ENGR 301, each student team must develop a hands-on project which teaches an engineering principle. Then, the student teams go to a K-12 classroom to conduct their project with those students. The service learning component requires students to demonstrate knowledge of ethical values in non-classroom setting as the students must convey their obligations to serve society, ensure the safety of the K-12 students, and educate the K-12 students on how to responsibly apply scientific knowledge.

**Unwritten Laws of Engineering**

In 1944, W. J. King published, “The Unwritten Laws of Engineering,” in the *Mechanical Engineering Magazine*. Students are encouraged to purchase a revised version available at the following website: https://www.asme.org/products/books/unwritten-laws-revised-and-updated. Many of the principles along with course specific policies are taught throughout the course to assist students in developing their professional persona. The teaching team is dedicated to ensuring that all students are engaged in a positive learning environment. As such, the teaching team tries to act in a “coaching” capacity as well as in a “supervisory” role. As such, the teaching team will require students to behave in a professional manner. Students may disagree with the policies of the course and the “Unwritten Laws”; however, it is the duty of the teaching team to ensure that the students understand the learning objectives and adhere to the course policies. Thus, when the disagreements change from opinion to negative or disrespectful action, consequences related to the course grade may occur. In some cases, misconduct charges may be filed with the University. The following Unwritten Laws are written and documented for the purpose of preventative measures, communicating expectations, and explaining why some of the “Unwritten Laws” exist. Mr. King’s Laws are italicized with commentary about how it applies to class:

1. *However menial and trivial your early assignments may appear, give them your best efforts.* The course engages in development curriculum. Development curriculum is where assignments (big
and small) help to advance skills and build upon the previous lessons. When assignments or lessons are dismissed, the successful completion of future assignments will be impacted.

2. **Demonstrate the ability to get things done:** initiative, resourcefulness, ingenuity, persistence, and tenacity. Modern resources such as the internet, smartphones, and computers are excellent tools that provide instant information, but they are not substitutes for actively engaging and learning the course material. Time and effort along with innovation, creativity, efficiency, accuracy, and attention to detail are all needed to successfully complete assignments.

3. **Strive for conciseness and clarity in oral or written reports; be extremely careful of the accuracy of your statements.** Engineers are held to high standards of accuracy in all work, discussions, and statements. All of which should be well supported with data and research. Care to select credible resources and references is also necessary. For example, open sourced sites like Wikipedia, blogs, opinion pieces, and many news articles are not reliable sources. The internet provides thousands of pages to support any opinion that anyone has. However, those pages may not be peer reviewed by experts in the field or supported by actual facts. Engineers must learn to distinguish between fact and opinion.

4. **One of the first things you owe your supervisor is to keep him/her informed of all significant developments.** Similar to a supervisor, the teaching team wants all students to be successful. As such, when problems arise, students must inform the teaching team. The teaching team will make all efforts to resolve the situation. If the issue is hidden from the teaching team, severe consequences may occur.

5. **Do not overlook the steadfast truth that your direct supervisor is your "boss" and has earned that position.** All students have excellent skills and accomplishments. The entire teaching team does as well. Students are expected to be respectful to the teaching team. The material taught within the course has been well researched, is peer-reviewed by panels of experts, and is award winning.

6. **Be as particular as you can in the selection of your mentor.** Many cultural elements such as TV shows and movies create the image that being "cool" equates to being rude and mean. These fictional characters should not be considered role models. Students are expected to be professional and respectful in all interactions with their peers and the teaching team.

7. **Cultivate the habit of seeking other peoples' opinions and recommendations.** Students will engage in peer editing sessions to receive recommendations from their colleagues. Students are also welcome to use the Writing Center, grammar editing software, and meet with the teaching team for supplemental help and learning.

8. **Promises, schedules, and estimates are necessary and important instruments in a well-ordered business.** The teaching team does not engage in micro-managing. Students are expected to create their own schedules to accomplish assignments. The teaching team is not responsible for reminding students to be prepared for deadlines.

9. **In dealing with customers and outsiders, remember that you represent your company, ostensibly with full responsibility and authority.** When working with the K-12 students, the UNR students are expected to adhere to the County and School policies and represent UNR in a professional and respectful manner. Further, students are expected to conduct themselves professionally both inside and outside of the classroom. Students are to be professional and respectful while in the foyer of SEM 131.

10. **One of the most valuable personal traits is the ability to get along with all kinds of people.** All students will be working in multi-disciplinary teams. On-task conversations are expected to be
respectful and professional. Off-task conversations are discouraged and should be separated from team meetings.

11. *Never underestimate the extent of your professional responsibility and personal liability.* Students will be held to high standards in order to ensure a globally competitive education. Lackadaisical efforts or the excuse of ignorance will not be rewarded.

12. *Let ethical behavior govern your actions.* The University’s student conduct policies are strictly enforced.

13. *Be aware of the effect that your personal appearance and behavior have on others and, in turn, on you.* While many try to deny that appearance is a factor, branding and image communicate messages.

14. *Maintain your employability.* Whether going into industry or academia, students should seek to learn and not “just get through it.” Engineers must engage in professional development and embrace life-long learning.

Folders

Portfolios are prepared for each student. The folder includes the grading sheet and professional development worksheet. The grading is made available to ensure constant communication regarding the grades earned in the course. The cabinet containing the folders is located in SEM 131. Upon entering the foyer, the cabinet is located by turning right and looking right (south end of foyer). Students are welcome to take their folders, but folders must be returned for all major deadlines and upon request. The following folder rules are designed to ensure grading efficiency.

1. Papers may not be removed from the folder. (The teaching team needs to review the material to research trends and develop coaching strategies.)
2. Papers are not to be rearranged. (Some grading is based on improvements, so the teaching team needs to quickly find material to provide better coaching. The folders are arranged consistently for efficiency.)
3. Students should include their names and sections and team numbers on all material.
4. Presentation slides must be in handout format with six slides per page. The slides should also have names, section, and team number on the first slide.
5. All assignments and documentation unless otherwise specified must be typed.
6. Only members of the teaching team are allowed to add material to the prongs. All material submitted by the students should be placed in the front of the folder but not in the prongs.
7. Folders should not be used as personal storage. Papers that are not assignments will be removed from the folder and placed in a bin.
8. All team assignments must be placed in the team folder.
9. All instructions must be read and followed. Students will be held responsible for knowing submittal instructions.
10. All professional development activities must be recorded on the Professional Development Sheet. Failure to do so will result in no credit for that activity. Documentation for the activity should be placed in the front of the folder.
11. All folders must be in the cabinet for all due dates. Also, to ensure timely feedback for impromptu assignments, the folder should be submitted to the cabinet frequently.
12. Lost folders will result in zero credit.
Letter Grade Expectations

In order to clearly communicate the expectations of the class, Table 4 compares the letter grade to the level of achievement required.

Table 4: Comparison of letter grade to course requirements to communicate expectations.

<table>
<thead>
<tr>
<th>Letter Grade</th>
<th>Expectation</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Significantly exceeds minimum requirements in all assignments; demonstrates innovative, creative, and effective content to engage and inspire audiences while being concise and adhering to all requirements; displays advanced understanding of all concepts; masters course content and is able to instruct others on the material; engages in critical thinking; if entering a room anywhere in the world, student will be one of the best speakers and writers in the room.</td>
</tr>
<tr>
<td>B</td>
<td>Exceeds minimum requirements in some areas but not all; effectively uses creativity to develop engaging content while being concise; learns the course content sufficiently enough to develop examples; usually engages in critical thinking; if entering a room anywhere in the world, student will be either one of the best speakers or writers and show proficiency in the other form.</td>
</tr>
<tr>
<td>C</td>
<td>Uses examples as templates; does not attempt to achieve anything greater than accomplishing the defined task; develops bland or fluffy content; neglects details; learns the course content sufficiently enough to regurgitate; sometimes engages in critical thinking; sometimes shows lackadaisical efforts; if entering a room anywhere in the world, student will perform as an average speaker and writer.</td>
</tr>
<tr>
<td>D</td>
<td>Completes the assignment by only fulfilling minimum requirements; has poor quality assignments; neglects to adhere to instructions; rarely engages in critical thinking; shows lackadaisical efforts; if entering a room anywhere in the world, student will perform below average or show poor proficiency as a speaker or writer.</td>
</tr>
<tr>
<td>F</td>
<td>Does not meet minimum requirements; engages in unprofessional, disrespectful, or unethical behavior; does not improve or progress; does not demonstrate learning or achievement of course objectives; does not engage in critical thinking; approaches assignments with lackadaisical effort; if entering a room anywhere in the world, student will perform well below average and show poor proficiency as a speaker and writer.</td>
</tr>
<tr>
<td>+/-</td>
<td>Adjustments to reflect variations within letter grade category.</td>
</tr>
</tbody>
</table>
Impromptu Improvements

Impromptu improvement assignments are designed to assist students in learning specific skills. An impromptu is defined as doing an activity without preparation. Impromptu assignments reflect the day-to-day expectations of people in industry and academia. Due to the “surprise” nature of the assignment, there are no make-up assignments available for absent students.

Many assignments, reports, meetings, and discussions are done without time to prepare or to create a formal communication strategy. For example, supervisors may ask their employees to give an update on a project during the meeting. The employees would be expected to immediately answer in a clear, concise, and coherent way. Some of the impromptu assignments simulate these types of situations. Some impromptu assignments must be completed immediately and submitted in-class.

Many assignments, reports, meetings, and discussions are given a minimal amount of preparation time, and the requirement or instructions are given during the class discussion. As another example, administrators in academia may ask researchers to provide data for a donor. The administrators may give verbal instructions and only a few days to the researcher to collect the information. Thus, some impromptus are designed to simulate these types of situations. Students are expected to document the parameters of the assignment and due date in-class knowing that those details will not be made available again.

Professional Development

Students earn credit for seeking professional development opportunities and engaging in lifelong learning activities.

Students must record their activity on their professional development worksheet and submit documentation in their individual folders. Documentation is to be placed in the front of the folder. Documentation should be in memo format. The contents of the folder should not be rearranged; the worksheet should not be removed. Items not properly documented or recorded on the worksheet will not receive credit. Students are encouraged to submit documentation early in order to ensure full credit and have the opportunity to correct errors.

Students will receive credit based on the following methods. Any combination or repetition (except where noted) of the activities is accepted. Events related to work such as interviews, trainings, or meetings are not eligible. If credit is being earned in another course for the event, the event is not eligible.

- Membership in a professional society. (one point; not eligible for repeated credit; documentation includes a copy of membership card, receipt of membership, or logged screen [printed screen shot must show name and must be after a successful login]; must be professional chapter as local UNR student chapter not eligible)
- Attendance to the UNR Engineering Career Fair. Other career fairs are only eligible with instructor permission. (one point; list of companies visited with a few sentences about discussion with that company)
• Completion of a professional development module (within each Volume, a table of contents lists several modules) (or Podcast excluding Ethics Module; module link is available on the course website. (one point per completed module; one paragraph written summary)

• Attendance to an engineering or technical seminar. Seminars required for other classes are not eligible. Seminars in which extra credit is earned for other classes are not eligible. (one point; one paragraph written summary).

• Attendance to a Toastmasters meeting. (one point; one paragraph written summary)

• Review of a conference paper, professional society news article, or journal article (one point; one paragraph written summary)

• Viewing of designated video series as posted on the website. (one point per designated series; one paragraph written summary per video within series; all videos in series must be viewed and summarized to earn one point)

• Attendance to a meeting of a professional society. (one point; one paragraph written summary)

• Attendance to a dissertation or thesis defense. (one point; one paragraph written summary)

• Other items as approved by the instructor.

Grammar Basics

Subject / Verb Agreement

The subject and verb must agree in number.

• A singular subject needs a singular verb while a plural subject needs a plural verb.
  o We are trying a new approach.
  o I am trying a new approach.

• Ignore phrases and clauses that separate a subject with the verb.
  o The computers in the box are fragile.
  o The director, along with the customers, is at the meeting.

• If multiple subjects are joined with and, use a plural verb.
  o The engineer and the manager are working together.

• If multiple subjects are joined with or, use a singular verb. When the subjects have different numbers, make the verb agree with whichever is closest (hint: singular first, it sounds better).
  o The engineers or the manufacturer drafts the changes.
  o The manufacturer or the engineers draft the changes.

• A singular verb should be used after each, everyone, everybody, nobody, somebody, every, one, another, and much.
  o Every engineer is required to be on time.

• A plural verb should be used after both, few, many, others, and several.
  o Several were upset with the new policy.

• If a group is acting as unit, a singular verb is used. If the members of the group are acting separately, a plural verb should be used.
  o The Board of Directors has the final vote.
  o The board members were not in agreement.
Noun / Pronoun Agreement
In technical writing, the first person (I, me, my, mine, myself, we, us, our, ours, and ourselves) must be avoided. Third person is acceptable. Addressing the reader (second person: you, your, yours, and yourselves) must be avoided. Table 5 illustrates the pronoun cases and first, second, or third person.

<table>
<thead>
<tr>
<th>Case</th>
<th>First Karun</th>
<th>Third Karun</th>
<th>Third Karun</th>
<th>First Karun</th>
<th>Third Karun</th>
<th>Second Karun</th>
</tr>
</thead>
<tbody>
<tr>
<td>Nominative</td>
<td>I</td>
<td>he</td>
<td>she</td>
<td>we</td>
<td>they</td>
<td>who</td>
</tr>
<tr>
<td>Objective</td>
<td>me</td>
<td>him</td>
<td>her</td>
<td>us</td>
<td>them</td>
<td>whom</td>
</tr>
<tr>
<td>Possessive</td>
<td>my mine</td>
<td>his hers</td>
<td>our ours</td>
<td>their theirs</td>
<td>whose</td>
<td>your yours</td>
</tr>
<tr>
<td>Reflexive</td>
<td>myself</td>
<td>himself</td>
<td>herself</td>
<td>ourselves</td>
<td>themselves</td>
<td>yourselves</td>
</tr>
</tbody>
</table>

- If I, he, she, we, or they can be exchanged, use who or whoever.
  - Who was chosen? (He was chosen.)
- If me, him, her, us, or them can be exchanged, use whom or whomever.
  - Whom did you ask? (I asked him.)
- Pluralize to avoid gender issues.
  - Each engineer must meet with his interns.
  - Engineers must meet with their interns.
- Reflexive tense only appears if the subject is mirrored in the sentence.
  - You must see it for yourself.

The subject and pronoun must agree in number.
- A singular subject needs a singular pronoun while a plural subject needs a plural pronoun.
  - Correct: The student must submit his work. [singular subject; singular pronoun]
  - Correct: The students must submit their work. [plural subject; plural pronoun]
  - Incorrect: The student must submit their work. [singular subject; plural pronoun]

Passive versus Active Voice
- Passive voice is when the verb contains a derivation of “to be.”
  - Passive: The results were presented by the manager.
  - Active: The manager presented the results.
- Passive voice is when the main verb is written in the past form.
  - Passive: It was recommended to accept the proposal
  - Active: The manager recommends the acceptance of the proposal.
- The sentence often contains a prepositional phrase beginning with “by.”
  - Passive: The results were presented by Kathy.
  - Active: Kathy presented the results.

There are disadvantages and advantages. Disadvantages of using the passive voice are that it is wordy, confuses the meaning, hides the doer, and is boring. Advantages of using the passive voice are that the doer does not have to be known, the doer is unimportant, and it tends to be more tactful. While engineers seek to de-humanizes the work, active voice should be used whenever possible; however, technical writers are careful to avoid using the first and second person pronouns.
Punctuation

Quotation Marks
- Use quotation marks when the exact words of the speaker are used.
  o Dr. Joe said, “The exam is tomorrow.”
- Use quotation marks when words or phrases are being used as expressions.
  o Mark the envelope “Confidential.”
- Periods and commas always go inside the quotation marks. Colons and semicolons always go outside of the quotation marks. Question marks and exclamation points can go either place.
  o The speaker asked, “How many people like Six Sigma?”
  o When will the speaker stop saying “um”?

Commas
- Use a comma where there is a list of three or more items. Do not use a comma if there are only two items.
  o The dog, cat, and bird ran.
  o The cat ran and jumped.
- Use a comma in a sentence where two complete thoughts are used and separated by and, or, but, for, nor, so, or yet.
  o The scientists found the results, but the engineer disagreed.
- Use a comma to set off an introductory dependent clause.
  o Because the results were wrong, the project was rejected.
- Use a comma to set off parenthetical information.
  o Dr. Joe, the professor, was late to class.
- Use a comma between consecutive adjectives where the and is eliminated.
  o It is difficult to go to class on a clear, sunny day.
- Use a comma if addressing someone by name.
  o Be sure to lock the door, John, before you leave.
- Use a comma to separate the year from the day, but a comma is not used to separate the year from the month.
  o December 30, 2017
  o December 2017

Semicolons
- Use a semicolon instead of a coordinating conjunction (and, or, but, for, nor, so, or yet).
  o The scientist found the results; the engineer disagreed.
- Use a semicolon when two independent clauses are joined by a transition expression (however, furthermore, therefore, accordingly, etc.).
  o The scientist found the results; however, the engineer disagreed.

Colons
- Use a colon after a salutation in a business letter.
  o Dear Dr. Joe:
- Use a colon to separate a title from a subtitle or hours and minutes.
  o Grammar for Engineers: A Complete Guide
  o 1:10
• Use a colon to represent the word “to” in a ratio.
  o 5:1
• Use a colon for a long list.
  o The part list includes the following items: speakers, CD player, keyboard, mouse, and monitor.

Dashes
• Use a dash to indicate emphasis.
  o We should diagnose—before calling maintenance—the problem.

Parentheses
• Use parentheses to de-emphasize information.
  o The managers (all engineers) were successful in winning the proposal.

Apostrophes
• Use apostrophes to show possession.
  o Woman’s, women’s
• Apostrophes can be used for contractions; however, in technical writing, contractions are not allowed.
• Use apostrophes to form a plural if the omission of it would be confusing.
  o Instead of “dotting the is,” it would be “dotting the i’s”

Hyphens
• Use hyphens when a compound noun does not have a noun as one of its elements (two-by-four), ends with a prepositional phrase (jack-of-all-trades), has a single letter in front of it (x-ray or e-mail), and when two nouns signify one thing (editor-publisher).

Capitalization
• Capitalize all official titles of honor and respect when they precede personal names.
  o President Joe
• Do not capitalize the title if the name follows it or is set off by commas.
  o Joe, the president, is over there.
  o The president, Joe, is over there.
• Capitalize the first, last, and all principal words of books, plays, and television programs. Articles, conjunctions, and short prepositions (less than five letters) are not capitalized; unless, they are at the beginning of the title.
  o *Fiddler on the Roof*
  o *Going Through Changes*
• Capitalize the full and shortened names of government agencies, departments, etc.
  o Please contact the Department of Defense.
• Capitalize all academic degrees that follow a name, whether they are abbreviated or written out.
  o Joe Bob, Ph.D.
• Capitalize all academic and religious titles such as doctor, professor, dean, and bishop when they precede a name, but not capitalize them if they stand alone.
  o Doctor Joe is over there.
  o The doctor will be here in five minutes.
• Capitalize trade names.
Post-it notes

- Capitalize official names of buildings, streets, and other public places.
  - The Palmer Engineering building is on Record Street.
- Do not capitalize seasons or time (a.m. or p.m.).
- Always capitalize the following
  - Days of the week, months, holidays, periods (events in history), special events, official documents, formal epithets, geographical names, sections of a country, landforms, bodies of water, and public places.

Misused Words

**Affect / Effect**

- *Affect:* to influence, to change
- *Effect:* impression, results

**Imply / Infer**

- *Imply:* to throw out a hint or suggestion
- *Infer:* to take in a hint or suggestion

**Among / Between**

- *Among:* used for more than two things
- *Between:* used for only two things

**Less / Fewer**

- *Less:* used for quantities
- *Fewer:* used for individual units, numbers

**Farther / Further**

- *Farther:* physical measure of distance
- *Further:* degree or extent

**Principal / Principle**

- *Principal:* main (person)
- *Principle:* a theory, idea, or law

Common Errors

[Soskey, G. “Grammar Police: 25 of the Most Common Grammatical Errors We All Need to Stop Making.” HubSpot, 2015.]

1) They're vs. Their vs. There
   “They’re” is a contraction for "they are"; “their” refers to something owned by a group; “there” refers to a place.

2) Your vs. You're
   The difference between these two is owning something (your) versus actually being something (you’re; which is a contraction for you are).

3) Its vs. It's
   "Its" is possessive and "it's" is a contraction of "it is."

4) Dangling Modifiers
   This mistake happens when a descriptive phrase does not apply to the noun that immediately follows it.
5) i.e. vs. e.g.
Lots of people use the terms interchangeably when trying to elaborate on a point, but they really mean two different things: "i.e." roughly means "that is" or "in other words," while "e.g." means "example given" or "for example."

6) Peek vs. peak vs. pique
- Peek is taking a quick look at something -- like a sneak peek of a new film.
- Peak is a sharp point -- like the peak of a mountain.
- Pique means to provoke or instigate -- like pique interest.

7) Assure vs. Insure vs. Ensure
All of these words have to do with "making an outcome sure," which is why they are so often mixed up. However, they are not interchangeable.
- "To assure" means to promise or say with confidence. For example, "I assure you that he is good at his job."
- "To ensure" means to make certain. For example, "Ensure you are free when I visit next weekend."
- "To insure" means to protect against risk by regularly paying an insurance company. For example, "I insure my car because the law requires it."

8) En Dash vs. Em Dash
Both "–" and "—" are versions of the dash: "–" is the en dash, and "—" or "--" are both versions of the em dash. Either the en dash or the em dash can signify a break in a sentence or set off parenthetical statements. The en dash can also be used to represent time spans or differentiation, such as, "That will take 5–10 minutes." The em dash, on the other hand, can be used to set off quotation sources, such as, "'To be, or not to be, that is the question.' —Shakespeare."

Numbers
Basic Rule: Numbers from zero to ten are expressed as words. Numbers from 11 and above are expressed as figures.

Express as Words
- If the number begins a sentence.
- If two numbers are being used together (use smaller of two)
  - Two 3-pocket file folders
- For approximations
  - About a thousand
- If using ordinals
  - The eleventh person
- If the work "o'clock" is understood
  - It is five.

Express as Figures
- For dates and times
- If the number follows a noun such as page, chapter, etc.
- If a unit follows the number
Watch Consistency
For example, “two-by-four inch piece of wood” and “2 in. x 4 in. wood” are correct, but those methods cannot be mixed together. For example, “2 by 4 inches” is incorrect. Units are always abbreviated and separated by the number with a space. It is 5 m long. Units should always be given in the SI terms. If there was a reason for choosing unusual SI units because they made sense when they were in U.S. units, that detail should be noted. For example, “a piece of wood with the dimensions of 5.08 cm x 10.16 cm (2 in. x 4 in.) is chosen for this project.” Non-SI units are followed by a period (they are considered abbreviations); SI units do not have a period (they are considered symbols).

Tips for Proofreading
- Proofread important or technical material at least twice.
- To check numbers, try to read numbers digit by digit backwards.
- Use a yellow sheet of paper to go line-by-line.
- Read the material backwards. It prevents your brain from filling in missing information.
- Check all calculations in tables. This is especially important when using Excel with formulas. Excel will calculate several decimal places even if it only displays a few decimals places.

Formatting Requirements
All editors, publishing agents, corporations, and academics have different formatting requirements. For ENGR 301, there are also specific formatting requirements. Publishing manuals such as MLA, APA, and Chicago are not utilized. Students should not rely on automatic formatting software.

Style Notes
Proper formatting includes these elements:
- Unless otherwise specified, all assignments must be in memorandum format with the heading being “To, From, Date, and Subject.” Handwritten initials are required next to the “from” line.
- Team and section numbers are required on all assignments.
- Block style (justified at both left and right margins) with no paragraph indents.
- New paragraphs are denoted with a line space.
- Single spacing.
- One-inch page margins.
- Line space to offset tables and figures from text.
- Font size is 12.
- Consistent with fonts for headings and subheadings.
- Numbered pages except for the first page.
- Figures and tables are properly numbered throughout the entire paper (there should only be one Fig. 1 and one Table 1).
- Appendices should be renumbered with only the cover sheet reflecting the continued page number. Figures and tables should be renumbered in an appendix.
References
In engineering, references serve as evidence. All contentions must be well supported with evidence. Use of a reference without citing it defines plagiarism and will result in course failure. The references in the Reference Section must match the references in the text. The in-text citation must be the same words in the reference section to ensure the reader can find the appropriate reference. Only quality references will be accepted. Quality references include peer-reviewed articles and publishing companies taking responsibility for the accuracy of the content.

In-text citations
The format for books, journals, and articles consists of using square brackets, the first author’s last name, a comma, and the year [Bauer, 2017]. For information obtained on a website, it should be formatted with the name of the home page followed by the word, “website” [ENGR 301, website].

Reference Section
After the Conclusion or Acknowledgement Section but before the Appendix, the Reference section should appear and be titled, “References.” “Works Cited” or other variations are not permitted. A few examples of how to prepare references for the Reference Section are detailed.

Journal Article in Print
Last Name, First Initial. (repeat for each author with a comma separating each name) “Title of Article.” Name of Journal, Vol. #, Ed. #. Publishing Year.


Book
Last Name, First Initial. (repeat for each author with a comma separating each name) Title of Book. Placed published: publisher. Year.


Website (including material obtained from a website)
Name of Home Page (website). Retrieved from (give address without hyperlink underline or color change).

ENGR 301 (website). Retrieved from http://wolfweb.unr.edu/~cbauer/engr301/

Figures
In order to place a figure in the text, proper formatting is necessary. First, the figure should be a graphic, picture, or chart. The figure should be as close to the text as possible, but it should never be presented before the figure is discussed in the text. If referring to Fig. 1 in the text, it should be abbreviated as demonstrated. The only time that the word is spelled out is when it starts a sentence. Figure 1 shows how a picture should look in text. The figure should always be described in the text. If the figure is not
original or part of a free use agreement, the figure must be referenced. The caption of the figure is placed at the bottom of the figure.

Fig. 1: Racecar safety requires roll bars, seatbelts, and helmets; all of which combine to ensure driver and passenger safety [MS Office, website].

Tables
A table is similar to a figure. However, the word “table” is always spelled out. Tables should be referenced in the text. The text should detail the result of the table. Most tables are used to list something, such as a budget. It is necessary to discuss the budget’s total. For example, the total budget as illustrated in Table 6 is about $15. The caption for a table is placed above the table. Units are necessary in the table. Illustrated in Table 6 are two ways that units can be presented (for illustrative purposes only, but one technique should be selected. The table should be centered.

Table 6: The budget projections illustrate a cost-effective project.

<table>
<thead>
<tr>
<th>Item</th>
<th>Quantity</th>
<th>Cost [$]</th>
<th>Total</th>
</tr>
</thead>
<tbody>
<tr>
<td>Book</td>
<td>1</td>
<td>5</td>
<td>$5</td>
</tr>
<tr>
<td>Shoe</td>
<td>2</td>
<td>4</td>
<td>$8</td>
</tr>
<tr>
<td>GRAND TOTAL</td>
<td></td>
<td>$13</td>
<td></td>
</tr>
</tbody>
</table>

Equations
Equations must be written properly. Microsoft’s Equation Writer is a tool available to ensure the proper formatting. Alternatively, equations written in programs such as MathCAD can be copied and pasted into the document. Equations should be introduced, discussed, labeled, and explained in the text. Force is described in Eq. (1):

\[ F = m \cdot a \]

where F is force, m is mass, and a is acceleration. If units are needed (not following standard SI) in the text, the units can be written, “where F is force in Newton, m is mass in grams, and a is acceleration in meters per second squared.”

Appendix
An appendix is its own independent document: if the appendix is removed from the paper, it should be coherent within itself.

The appendix begins with a cover sheet that has the appendix letter and title. The cover sheets are numbered consecutively with the main text of the paper: if the main text ends on Page 14, Appendix A cover sheet is Page 15, Appendix B cover sheet is Page 16, and the pattern continues. Within the appendix,
the first page is labeled with the letter and page number: the first page of Appendix A is A-1. Figure and table numbers restart beginning at Fig. 1 and Table 1 and are numbered consecutively after that.

If a reference is used in the appendix, that appendix must have its own reference section.

The order of the appendices must be the same order in which they are introduced and discussed within the main text. For example, the first appendix discussed in the text must be Appendix A. All appendices must be thoroughly described and discussed in the main text.

Technical Writing Overview
Technical writing is unlike creative writing. Characteristics of creative writing include allowing the audience to infer meaning or draw their own conclusions, offering opinions, lengthened the text and adding descriptions for the sake of storytelling, using pictures, being persuasive, and providing opinions as evidence. Technical writing uses the concept of "PACTUS": Precise, Analysis, Concise, Tables/Figures, Unbiased, and Supported.

Technical writing is precise and accurate. Students should avoid creating deception or over exaggerating contentions. For example, making statements like "the most important thing is..." or "it is a huge problem..." are misleading and hyperbolic.

Technical writing uses analysis not opinions. Using the technique of "copy, paste, and change a few words," is not engaging in analysis. Engineers are valued for their ability to do more than regurgitate what is already there. Technical writing reflects the innovation and creativity of engineers.

Technical writing uses clear, plain, and simple vocabulary. Sentences must be structured to allow for clarity and coherency. Overly long and complicated structures will lead to error. Complex vocabulary will be ignored.

Tables and figures must be used to enhance the content of the paper. When describing something using words, if a table would help to clarify, the technical writer must choose to use a table. For example, if doing a comparison of products, a table showing the components of the products and which ones have it should be added. The importance of tables and figures and their descriptive captions in a written report should not be underestimated. There are not enough figures and tables unless the reader can understand 80% of the report by doing nothing other than looking at the tables and figures and reading the captions.

Technical writing is unbiased. While the report may be used to recommend a course of action, the writing should not hide the consequences nor disadvantages. Contentions must be supported with high quality evidence. That evidence must consist of data not opinions.

Technical Presentation Overview
Technical writing and technical presentations are opposite in style. Writing like one speaks will lead to a poorly written document. Speaking like one writes will lead to a boring and confusing presentation. Presentations are meant to be engaging, entertaining, interactive, and informative.
Presentations must be more concise than reports. Not all material in a report should be presented. Key components and highlights must be extracted from a written report and re-styled to become the content for a presentation.

Technical Briefing Assignment
The technical briefing is similar to an elevator speech. It should have an introduction, content, and conclusion. The speech may take the form of being informational or persuasive. The presentation will be completed individually.

- Length: Maximum of two minutes (with 30 seconds of tolerance)
- Topic: Any topic related to engineering, technology, or science (refer to assessment rubric for content requirements)
- Requirements: Professional attire; visual aids (PowerPoint or similar program); “handout” copy of slides

K-12 Project Requirements
Students will be placed into groups of three or four and will develop a design contest or hands-on design project to teach an engineering principle, ensure that the K-12 have fun with the lesson, and stimulate interest in engineering, science, and technical fields to K-12 students. The project is divided into two modules: proposal and final review. The content of the project consists of eight main components: the problem statement, design concept, literature search, marketing, instruction manual, methods, analysis, and project management.

Proposal: The proposal written report will have the problem statement, design concept, literature search, and project management completed in their entirety. An abstract, introduction, conclusion, and reference section must be completed to reflect the contents of the proposal report. The proposal presentation will only consist of the mechanics of a presentation (title slide, overview, and conclusion) and the following main sections: the problem statement, design concept, literature search, and project management.

Final Review: The final review report will be a completed report. First, the final review report will address and correct all of the technical edits given by the teaching team from the proposal report. The comments on the paper and the notation on the rubrics (grading and assessment) must be addressed. Failure to make improvements as suggested will result in twice as many points being deducted (it is possible to receive a negative score on the final review). Using the lesson learned from the proposal report edits as well as the classroom visit data, all of the sections will be modified, updated, and completed. The final review presentation will only consist of the mechanics of a presentation and the following main sections: marketing, instruction manual, methods, and analysis.

General Presentation Requirements: The presentation is a team presentation; however, each person is required to speak for an equal amount of time. The total presentation length is not to exceed 12:00 minutes including questions. Professional attire and visual aids are required. Students must speak about their designated main section. Additionally, team members should be selected to present the title slide, overview, introduction, and conclusion. Presentation mechanics (title slide, etc.) should be per team not
per individual. For the proposal presentation, time management points will be deducted if the presentation exceeds 12:30 minutes; the team may be stopped at 14:00 minutes with additional point deductions. For the final review presentation, time management points will be deducted if the presentation exceeds 12:00 minutes; the team will be stopped at 12:30 with additional point deductions.

**General Written Report Requirements:** The written report is a team report; however, each person is required to write an equal amount. Each main section must include at least one figure or table and at least one reference (formal citation from a publication). Additionally, the mechanics of the paper are divided among the team members. The mechanics include the abstract, introduction, conclusion, and references. The written report must follow the formatting requirements set forth in the grammar packet.

**Peer Edit Sessions:** Peer editing workshops will be conducted during class. Students are required to bring a copy of their sections (not compiled) in draft format to class for editing. A hard copy is required. After the peer edit, students will complete a final edit of the paper and compile the paper.

**Forms:** Due along with the proposal is the classroom visit form. Due along with the final review is the teacher evaluation form. The forms are available on the website. The forms should not be attached to the report. They should be placed into the team folder. For the final review, if there are updates or changes to the classroom visit form, that form must be resubmitted. Failure to submit these forms may result in zero credit be awarded for the course. Scanned or faxed copies are not permitted; only original forms are accepted.

**Submittal Instructions:** The peer edited rough draft and editing worksheet are to be submitted into the student’s individual folder. The final draft of each report is to be submitted into the team folder (only one per team is needed). The forms must be submitted to the team folder. Binders, report covers, or additional folders are not to be used; a staple is sufficient. Students may not submit an individual final draft; the only draft that will be graded is the compiled draft. Individual final drafts will be discarded and will result in a grade reduction.

**Elements of K-12 Project**

The content of the project consists of eight main components: the problem statement, design concept, literature search, marketing, instruction manual, methods, analysis, and project management. Additionally, the mechanics of a paper are required. The mechanics of a paper consist of an abstract, introduction, conclusion, and references. The paper must conform to the formatting requirements as outlined. The paper may be presented in any order which optimizes coherency. Each team member is assigned a role statement. Each team member is required to write and present on the assigned sections. Switching role statements is not permitted and will result in failure of the assignment.

**Role Statements**

*Teams of Four*

Team Member A: problem statement (written and presentation), marketing (written and presentation), overview (presentation), and reference section compilation (written)

Team Member B: design concept (written and presentation), methods (written and presentation), title slide (presentation), and abstract (written report)
Team Member C: literature search (written and presentation), instruction manual (written and presentation), question solicitor (presentation), and introduction (written)
Team Member D: project management (written and presentation), analysis (written and presentation), and conclusion (written and presentation)

Teams of Three
Team Member E: literature search (written and presentation), methods (written and presentation), title slide (presentation), question solicitor (presentation), and abstract (written)
Team Member F: design concept (written and presentation), marketing (written and presentation), overview (presentation), and introduction (written)
Team Member G: project management (written and presentation), analysis (written and presentation), conclusion (written and presentation), and reference section compilation (written)

Each author’s name must appear next to the section heading. Editing team members’ sections without their active participation in the process is not permitted. Peer edits may be conducted in which suggestions are made, but all students are responsible for making their own edits. While some students may think they are helping their teammates, those students are hindering the learning opportunities of their peers. Additionally, because the papers have an individual grade, if the paper is edited incorrectly, that original author is held responsible.

Abstract
The Abstract should be written last. It should highlight the “wow” factors. Anything that is a result should be in the Abstract section. In general, it should be at least one sentence per section. The audience for this whole paper is a fellow engineering colleague. The Abstract should not be an advertisement or focused on only one section.

Introduction
The Introduction should briefly introduce the basic concept of the design project. The introduction should be in present tense (for example, “the Design Concept reviews...”). In general, the introduction should be one sentence per section.

Problem Statement
In the Problem Statement Section, a thorough description of the problem or need should be described. Aspects include what is missing in the current curriculum for students, how STEM education in the U.S. compares globally and nationally, and how these issues impact society in general. The Problem Statement section must include at least one reference and one figure or table.

Design Concept
In the Design Concept Section, a thorough description of the design project should be described. Aspects include who will be the audience for the design project, what lessons will be taught, what some initial requirements and restrictions are, what the agenda for the classroom visit will be, and what materials are needed. The specific Next Generation Standard the project addresses must be identified (http://www.nextgenscience.org/search-standards). The Design Concept section must include at least one reference and one figure or table.
Literature Search
The Literature Search Section should discuss what has been done in the past. The author should research projects that are similar to the project that the team is proposing. Previous projects should be analyzed by discussing what made those projects successful and how improvements or changes could be made. Details as to how the proposed project is different are needed to illustrate that the proposed project is not “stealing” intellectual property and to prove that the projects are not competing for the same audience. This section must include at least one reference and one figure or table.

Project Management
The Project Management Section should focus on two aspects: the schedule and the resources. For the schedule, a list detailing the tasks (what needs to be accomplished) and by when. A Gantt chart should be included in this section (this chart serves as a figure; the Calendar on the website shows the relevant project due dates; the chart should only include project-related dates). For the resources, the resources and facilities that the team will need must be detailed. The Project Management section must include at least one reference and one figure or table. Also, the elements from the team charter must be included. Each team member’s qualifications work experience are required. The goal is to prove that this team is capable of developing the project.

Marketing
In the Marketing Section, the marketing strategies must be detailed: how could the design project be modified to a different age group or audience (adaptability), who would be interested in the project, and how is the project competitive in the market (acceptability). All keywords and vocabulary (e.g., functional performance, acquisition cost, ease-of-use, operating cost, reliability, serviceability, and compatibility) must be used. In order to adapt into different age groups, the K-12 curriculum standards for each adaption must be illustrated. The appendix is a Strength, Weaknesses, Opportunities, and Threats (SWOT) analysis designed for school administrations to understand why they should invest in bringing the lesson plan to their schools. The SWOT analysis must be discussed in detail within the main text; however, the diagram should appear as the appendix. For example, “a SWOT analysis diagram is in Appendix A.” An appendix, reference, sub-section headings, and figure or table are required for the Marketing section.

Instruction Manual
In the Instruction Manual Section, the main points of the instruction manual for a future facilitator must be detailed. The actual instruction manual should not be a part of the main text; it must be included as the Appendix. For example, “the detailed instruction manual is in Appendix B.” Within the text, some of the important details within the instruction manual must be highlighted. The appendix must include a budget detailing how much it will cost to conduct the project, an agenda for the day of the project, and a schedule to setup the project. The audience for the instructional manual is a future facilitator of the project (teachers of that grade level). An appendix, reference, sub-section headings, and figure or table are required for the Instruction Manual section.

Methods
The Methods section consists of developing a formal lesson plan. The main text of the Methods section should be an overview of the lesson plan. The main text should fully describe the assessment techniques
that the team will use to ensure that K-12 students have fun, learn the lesson, and become aware of the engineering fields. The appendix of the Methods section must be a formal lesson plan and should follow the format as posted on the website. An appendix, reference, sub-section headings, and figure or table are required for the Methods section.

Analysis
For the Analysis section, the elements of formal documentation are required. The main text of the Analysis section consists of defining the criteria (numerical level of success for surveys; interview response goals; achievement levels for the assessment technique), detailing observations, providing the results, comparing the results against the criteria, analyzing the error, and creating recommendations (for a future iteration of the project). The appendix must consist of a blank copy of the survey and a blank copy of the material or handouts given to the K-12 students for assessment purposes (e.g., quizzes or worksheets). An appendix, reference, sub-section headings, and figure or table are required for the Analysis section.

Conclusion
The paper should be concluded with at least one summary sentence from each section. A list of topics reviewed is not sufficient. The statements must be summations.

References
The Reference section appears at the end of the paper after the conclusion but before the appendices. The first words of the citation must match the first words of the in-text citation. All references must be cited in the paper. Listing references without proper in-text citations is considered plagiarism. References must follow the formatting requirements for ENGR 301. MLA, APA, or other such formatting will not be accepted. If a reference is used only in an appendix, that appendix must have its own Reference section; that reference should not be listed in the Reference section of the main text. The references must be sorted alphabetically.

Grading and Assessment Rubrics for Technical Briefing, Proposal, and Final Review
Presentations and written reports are graded and assessed with the use a rubric. A check mark or a box left blank on the rubric indicates passing that standard satisfactorily. A dash indicates that the standard was unsatisfactory.

Presentation Grading Rubric
The presentation grading criteria (e.g., rubric) is detailed. Notes for the standard are described. This presentation rubric is used for the technical briefing, proposal presentation, and final review presentation. There are 50 standards on the rubric. The grade is calculated using Eq. (2):

\[
\frac{50 - \text{number of dashes}}{50} \cdot \text{maximum points} = \text{points earned}
\]

The presentation grading rubric is placed into five stages. The standard is indicated with a solid bullet point. Suggestions and best practices to meet the standard are indicated with an open bullet point.
Stage 1 Preparation

- Arranging room appropriately
  - Ensure podium is at correct height; nothing on stage over which to trip or fall; does not stand with shoulder to audience

- Prepared presentation notes and media in advance
  - Completes assignment before arriving to class; uploads presentation onto classroom computer (use USB drive; do not download from sites like GoogleDocs)

- Displaying practiced and rehearsed characteristics
  - Does not excessively exceed time constraints; prepares for presentation; does not “just wing it”

- Following presentation notes
  - Speaks on the same content as what is being displayed on the slide

- Staying focused on topic
  - Avoids going off on tangents

- Being a good audience member
  - Avoids texting, video game playing, sleeping, heckling, and other disrespectful behavior

- Demonstrating good teamwork skills
  - Clearly shows that the team rehearsed together and coordinated content
  - Not applicable for technical briefing

- Supporting teammates
  - Remains actively engaged during non-speaking role
  - Not applicable for technical briefing

- Organized stage entrance
  - Coordinates stage positioning

- Dressing appropriately
  - Wears professional attire

Stage 2 Basic Presentation Skills

- Projecting voice
  - Changes pitch and tone; has proper volume

- Maintaining an appropriate pace
  - Does not go too fast or too slow

- Enunciating clearly
  - Articulates words correctly

- Maintaining eye contact
  - Looks at audience

- Maintaining good posture
  - Keeps hands by side when not speaking or gesturing; does not lean; avoids resting hands on podium

- Establishing professional presence
  - Exhibits proper professional behavior

- Being knowledgeable on subject
  - Illustrates confidence in material and is able to make adaptations
• Having high quality visual aids
  o Professional looking aids and minimal errors; font size is large and legible; colors do not clash
• Providing proper introductions
  o States name at the beginning of the presentation
• Defining objectives clearly
  o Has an overview slide; states learning goals at the beginning

Stage 3 Enhancing Audience Experience
• Greeting and recognizing the audience
  o Welcome audience using a salutation
• Showing good energy and enthusiasm
  o Is not bland or monotone
• Maintaining positive facial expressions
  o Smiles at audience at appropriate times; does not look grumpy
• Gesturing with hands and arms
  o Use general hand gestures; does not hold wrist or restrict hand movement; does not hold hands in front of or behind of self
• Using lots of illustrations and examples
  o Gives more than one scenario or definition when explaining difficult concepts
• Managing time well
  o Completes presentation within time allotted
• Concluding appropriately
  o Gives summary statements; does not simply list topics; has a conclusion slide
• Using several pictures
  o Balances use of words, graphs, tables, and figures on slides
• Using aids effectively
  o Slides are not wordy; animations and background are not distracting
• Repeating participants' questions
  o Repeats the question or answers in complete sentence with keywords
  o Not applicable for technical briefing

Stage 4 Interacting with Audience
• Avoiding excessive use of fillers
  o Avoids multiple uses of ums, uhs, or other fillers
• Using appropriate humor
  o Humor is age appropriate for audience; uses humor to enhance content not to be a distraction
• Making smooth transitions between topics
  o Uses full sentences to introduce a new topic
• Engaging audience
  o Interacts with the audience; knows audience’s background; makes presentation interesting for the audience
• Demonstrating overall audience awareness
  o Reacts to the audience: slows down if audience appears confused or speeds up if audience gets restless
• Moving around room with energy
  o Does not cling to podium
• Organizing content logically
  o Ensures content is presented coherently; does not go back and forth
• Showing no detected nervousness
  o Avoids swaying or fidgeting
• Limiting use of prompts
  o Avoids using notes; avoids prolonged staring at screen or monitor
• Developing content completely and accurately
  o Content completeness is adjusted for time management; content is not excessively repetitious among teammates; content is correct and consistent among teammates

Stage 5 Advanced Presentation Skills
• Avoiding fillers
  o Does not use fillers
• Pausing for effect
  o Uses pause for drama and emphasis
• Maintaining direct eye contact
  o Targets all audience members; looks directly into eyes
• Using body language to convey additional information
  o Uses defined hand gestures to create visual aid
• Soliciting audience response
  o Asks audience a content related question or to do an action to show participation and involvement
• Controlling audience
  o Indicates how audience should respond
• Involving all participants
  o Integrates audience’s answers into content; adjusts to audience’s needs
• Accepting participants’ ideas and suggestions
  o Avoids arguing with audience members
  o Not applicable for technical briefing
• Providing positive reinforcement
  o Acknowledges audience members for asking questions
  o Not applicable for technical briefing
• Performing proper stage exit
  o Pauses and accepts applause before leaving stage or closing presentation
Written Report Grading Rubric

The written report grading criteria (e.g., rubric) is detailed. Notes for the standard are described. This written report rubric is used for the proposal and final review written reports. There are 25 standards on the rubric. The grade is calculated using Eq. (3):

\[
\frac{25 - \text{number of dashes}}{25} \cdot \text{maximum points} = \text{points earned}
\]  

(3)

The written report grading rubric is placed into three categories. The standard is indicated with a solid bullet point. Suggestions and best practices to meet the standard are indicated with an open bullet point.

Mechanics
- Demonstrates proper grammar and punctuation
  - Follows grammar rules as detailed in this document
  - Uses proper technical writing techniques
- Chooses proper vocabulary and avoids slang
  - Uses “students” not “kids”; “places” students into groups and does not “split” or “break” them
- Avoids addressing the reader and using personal pronouns
  - Avoids addressing the audience when using engineering tone (e.g., “as shown in Fig. 1”; not “see Fig. 1”); ensure vocabulary is audience appropriate; check format requirements to ensure proper audience selection; avoid the use of I, we, our, etc.
- Uses a formal style with a professional tone
  - Avoids contractions and clichés (such as “sparks interest”)
- Adapts writing style to correct audience
  - Proper selection of vocabulary and word use for audience
  - Adjusts selection and depth of material appropriately for audience
- Transitions well between sections
  - First and last sentences of each section contribute to overall flow of paper; does not abruptly change subjects
- Participated in peer review
  - Attends peer edit session; submits the peer-edited rough draft and worksheet into individual folder
- Responds to peer review corrections / suggestions
  - Makes appropriate changes as per the direction of the peer editor; if author disagrees with a correction, author must place an X over the change to show acknowledgement

Formatting
- Uses memo and block style formatting
  - Follows formatting requirements as detailed in this document
- Numbers figures, tables, and pages properly
  - Uses numbers and iterates numbers correctly
  - If tables or figures are not used, this standard is not met
• Uses sufficient and descriptive headings and subheadings
  o Consistently formats with teammates
  o Adds enough headings to allow audience to quickly locate key information
  o If no headings and subheadings are used, this standard is not met
• Formats tables and figures appropriately
  o Follows formatting requirements as detailed in this document
  o If no figures or tables are used, this standard is not met
• Formats in-text and full references correctly
  o Follows formatting requirements as detailed in this document
  o If no references are used, this standard is not met

Content Styling
• Develops content completely
  o Content must be thorough and concise
  o All components of assessment rubric are addressed
  o Clearly states and supports contention; does not rely upon inference
• Develops content accurately
  o Content must be correct
  o Content should not contain errors or misinterpretations
  o Content should be overexaggerated or overstated
  o Content should not be bias
  o Proper and consistent display of data (e.g., decimal points and significant figures)
• Uses figures and tables to enhance content and discusses in text
  o Uses at least one figure or table (meeting a minimum requirement does not necessarily meet the standard; using irrelevant figures or tables for the sake of it being there will not meet the standard)
  o Ensures that all content that can be enhanced by a figure or table is
  o Discusses, describes, and calls out the figure or table in the text
  o Ensures that the figure or table is legible and clear
• Develops descriptive and conclusive captions for figures and tables
  o Captions must describe what the figure or table is, what the audience member should conclude by looking at it, and how it is relevant to the content
• Provides sufficient evidence via use of references to support contentions
  o Uses references for paraphrasing and direct quotes
  o Uses reference for non-original artwork (clip art is excluded)
  o Supports contention with data and proof not opinion
  o Uses high quality references not opinion pieces
  o Uses primary sources where publishers take responsibility for accuracy of content and content is peer-reviewed by experts in the field
• Proves knowledgeable about subject matter
  o Is able to creatively expand on content and not simply regurgitate material
  o Contributes original thought and analysis of researched material
  o Fulfills all components of assessment rubric
• Organizes content logically and coherently
  o Order of sections makes sense for the project / paper as a whole
  o Order of paragraphs contributes to flow and enhances understanding of content
  o Figures and tables appear appropriately close to the discussion of their content
  o Sentence structure is not awkward
  o Avoids the “not only….but” structure

• Provides sufficient illustrations and examples
  o Ensures that all content on assessment rubric is well detailed
  o Uses multiple and diverse examples to support contentions

• Stays focused on topic
  o Avoids going off on tangents
  o Ensures paragraphs are topical
  o Avoids irrelevant content
  o Ensures content is concise

• Creates, supports, and develops thesis statements completely
  o Paragraphs begin with a thesis statement; the paragraph stays focused on that one thesis statement; thesis statement is supported with examples and evidence
  o Paragraphs longer than 15 lines are at a higher risk of not being coherent or focused on the thesis statement

• Demonstrates engineering analysis
  o Proves unbiased
  o Avoids using direct quotes (paraphrase and cite)
  o Avoid overstating results and findings

• Demonstrates coordinated team effort
  o Ensures that all team members agree on related issues such as the name of the project, criteria, and materials; checks that numbers for figures and tables are iterated correctly among the different sections (Fig. 1, Fig. 2, etc.; not all four figures labeled as Fig. 1)
  o Content contributes to the betterment of the paper as a whole

Technical Briefing Assessment Rubric
The technical briefing assessment rubric compares the content of the presentation to the Student Learning Objectives.

• Explains how science relates to a problem of societal concern
• Distinguishes between sound and unsound interpretations of scientific information
• Illustrates a knowledge of contemporary issues
• Demonstrates the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context
• Employs cogent reasoning methods in their own examinations of problems and issues
• Describes how scientific and technological developments affect society and the environment
• Identifies the multiple ethical interests at stake in a real-world situation or practice
• Identifies ethical concerns in research including academic integrity, use and citation of sources, the objective presentation of data, and the treatment of human subjects
Proposal Presentation Assessment Rubric

The assessment rubric compares the content of the presentation to the Student Learning Objectives. Addressing the components of the assessment rubric will help focus the content of the presentation and optimize the content requirements on the grading rubric.

Problem Statement:
- States clearly and specifically a problem statement
- Includes aspects of what is missing in current curriculum
- Has more than one example (test score, entrance into STEM, etc.)
- Shows how problem impacts society
- Illustrates global understanding by comparing education with several countries

Design Concept:
- Defines who will be the audience for the design project
- Defines what lessons will be taught (which curriculum standard)
- Defines what some initial materials, requirements, restrictions (rules/criteria) are
- Includes what the agenda for the classroom visit will be
- Illustrates how design concept addresses problem statement

Literature Search:
- Researches projects that are similar to the project that is being proposed
- Shows how the projects have been successful or not successful
- Shows how the proposed project is different and original
- Compares more than one contest/project or lesson
- Defines clearly as to what projects are being compared

Project Management:
- Highlights tasks on the critical path
- Discusses what resources and facilities the team will need
- Includes the elements from the team charter
- Briefly describes each team member’s qualification and work experience
- Proves sufficient "big picture" understanding of project for successful completion

Proposal Written Report Assessment Rubric

The assessment rubric compares the content of the written report to the Student Learning Objectives. Addressing the components of the assessment rubric will help focus the content of the report and optimize the content requirements on the grading rubric.

Abstract, Introduction, Conclusion, and References:
- Completes to standards
Problem Statement:
- States clearly and specifically a problem statement
- Includes aspects of what is missing in current curriculum
- Has more than one example (test score, entrance into STEM, etc.)
- Shows how problem impacts society
- Illustrates global understanding by comparing education with several countries
- Distinguishes between sound and unsound interpretations of the data; synthesizes and analyzes the data
- Conducts research as to how others have addressed improving STEM education

Design Concept:
- Understands the interaction between engineering and education
- Includes such aspects as who will be the audience for the design project
- Defines what lessons will taught (includes curriculum standard)
- Defines what some initial requirements / restrictions are
- Includes what the agenda for the classroom visit will be
- Details what materials are needed
- Illustrates how design concept addresses problem statement

Literature Search:
- Researches projects that are similar to the project that being proposed
- Shows how the projects have been successful or not successful
- Shows how the proposed project is different and original
- Compares more than one contest/project or lesson
- Defines clearly as to what projects are being compared
- Distinguishes between sound and unsound interpretations of the data; synthesizes and analyzes the data
- Understands the interaction between engineering and education

Project Management:
- Creates a list of tasks detailing what needs to be accomplished and by when
- Includes a Gantt chart and identifies critical path; details Gantt chart and tasks through final review
- Identifies and discusses all tasks that must be completed (not just due dates)
- Discusses what resources and facilities the team will need
- Includes the elements from the team charter
- Describes each team member’s qualification and work experience
- Proves sufficient "big picture" understanding of project for successful completion

Final Review Presentation Assessment Rubric
The assessment rubric compares the content of the presentation to the Student Learning Objectives. Addressing the components of the assessment rubric will help focus the content of the presentation and optimize the content requirements on the grading rubric.
Marketing:
- Details overall marketing strategies
- Details who would be interested in the project
- Illustrates how the design project be modified to a different age group (adaptability)
- Illustrates how the project's adaptations for different grade levels fit into the K-12 standards
- Entices an administrator to adapt project by discussing SWOT analysis [not applicable for teams of three]

Instruction Manual:
- Includes a material list and budget detailing how much it will cost to conduct the project
- Includes an agenda for the day of the project
- Details a schedule to setup the project
- Details a brief overview of steps
- Illustrates best practices for a future facilitator based on lessons learned from classroom visit

Methods:
- Discusses the lesson plan designed to teach the students
- Illustrates why that particular lesson is important for the class (e.g., curriculum standards)
- Discusses the instructions for the students (e.g., contest rules or construction steps)
- Details the set-up utilized during the classroom visit
- Develops assessment plan to measure student learning

Analysis:
- Discusses the criteria (details numerical value for surveys; level of success on assessment)
- Describes observations during classroom visit
- Analyzes results in full detail; compares the criteria set-up prior to the classroom visit with the results obtained
- Discusses error analysis
- Details recommendations

Final Review Written Report Assessment Rubric
The assessment rubric compares the content of the written report to the Student Learning Objectives. Addressing the components of the assessment rubric will help focus the content of the report and optimize the content requirements on the grading rubric.

Abstract, Introduction, Conclusion, and References:
- Completes to standards and updates from proposal

Problem Statement, Design Concept, Literature Search, and Project Management:
- Adheres to assessment rubric for proposal written report
- Updates content for timeframe and accuracy
- Addresses all suggested edits (corrections on the paper and as noted as unsatisfactory on the rubrics)
Marketing:
• Details overall marketing strategies
• Details who would be interested in the project
• Explains all aspects of acceptability
  o functional performance (fun, learn lesson, and aware of engineering), acquisition cost (material cost), ease-of-use characteristics (instruction manual), operating cost (classroom time not a dollar amount), reliability, serviceability, and compatibility
• Illustrates how the design project may be modified to a different age group (adaptability)
• Illustrates how the project's adaptions for different grade levels fits into the K-12 standards
• Includes a SWOT analysis diagram [not applicable for teams of three]
• Entices an administrator to adapt project by discussing SWOT analysis [not applicable for teams of three]

Instruction Manual:
• Discusses (in-text) only highlights of the instruction manual for the facilitator
• Understands the interaction between engineering and education
• Details complete instruction manual in appendix
  o Includes a title and overview
  o Includes a budget detailing how much it will cost to conduct the project
  o Includes an agenda for the day of the project
  o Details a schedule to setup the project
  o Details steps clearly and completely

Methods:
• Discusses the lesson plan designed to teach the students
• Illustrates why that particular lesson is important for the class (e.g., curriculum standards)
• Discusses the instructions for the students (e.g., contest rules or construction steps)
• Details the set-up utilized during the classroom visit
• Develops assessment plan to measure student learning
• Creates a fully detailed lesson plan in the appendix

Analysis:
• Discusses the criteria (details numerical value for surveys; level of success on assessment)
• Includes the survey and handouts as an appendix
• Describes observations during classroom visit
• Analyzes results in full detail
• Compares the criteria set-up prior to the classroom visit with the results obtained
• Discusses error analysis
• Details recommendations
White Paper Requirements and Evaluation Criteria

A white paper is a report meant to concisely inform readers about complex issues. A white paper is drafted by an expert in the field who shares his or her own solution or philosophy on the issue. The purpose of a white paper is to ensure that the reader understands the issue and is able to take action to solve a problem or make a decision.

Students are required to identify a contemporary (current) issue within their field (major or minor program of study). Using memo format, students will draft an approximate two-page document. The students must develop a title for the paper and include the title as the “Subject” in the memo heading. The title may be no longer than five words. The document must have a minimum of three quality references which are cited in-text and in a formal reference section.

The paper must use the following section headings and must detail the following content:
- Introduction – overviews the content of the paper.
- Issue – defines what the issue being addressed is and who else believes it is an issue.
- Impact – identifies the societal impacts of the contemporary issue; defines why this issue is significant using specific evidence and case scenarios.
- Recommendation – describes a solution to the problem; acknowledges the impact of that engineering solutions in a global, economic, environmental, and societal context; discusses the ethical and legal implications of enacting that solution.
- Conclusion - summarizes the paper.
- References – lists references cited in paper in full notation and properly formatted according to ENGR 301 standards.

Students will be evaluated using the following grading criteria:
- Communicates effectively by demonstrating proper grammar and formatting.
- Illustrates knowledge by coherently and concisely communicating contentions.
- Illustrates academic integrity with the proper use and citation of sources and the objective presentation of data.
- Issue: Identifies the societal impacts of the selected contemporary issue.
- Issue: Employs cogent reasoning methods in their own examinations of problems and issues.
- Impact: Distinguishes between sound and unsound interpretations of scientific information by selecting quality references and supporting contentions with sufficient evidence.
- Impact: Describes how scientific and technological developments affect society and the environment.
- Recommendation: Demonstrates the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- Recommendation: Integrates, synthesizes, and applies knowledge of the relationship between science and technology and societal issues.
- Recommendation: Identifies the multiple ethical and legal interests at stake in a real-world situation or practice.
Core Capstone Defense Requirements and Evaluation Criteria

ENGR 301 serves a core capstone class. By the end of the course, all students are required to have achieved the Student Learning Objectives (SLOs):

1. Students will be able to apply knowledge of mathematics, science, and engineering.
2. Students will be able to design and conduct experiments as well as to interpret data.
3. Students will have a knowledge of contemporary issues.
4. Students will have the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
5. Students will be able to function in a multi-disciplinary team.
6. Students will have an understanding of professional and ethical responsibility.
7. Students will be able to communicate effectively.
8. Students will have a recognition of the need for, and an ability to engage in life-long learning.

ENGR 301 is designed to help students in achieving these learning objectives; however, students should consider all of their efforts including previous and current coursework, extracurricular activities, work experience, volunteer activities, and non-school related activities when evaluating their achievement of the SLOs. In order to progress to degree completion and successfully complete this course, students are required to document how they have achieved each of the SLOs. The Core Capstone Defense consists of a written report and a team presentation.

Core Capstone Defense Written Report

As an individual effort, students will draft a written report to illustrate how they have personally achieved the SLOs. The report must be free from grammatical errors, formatted using ENGR 301 standards, and be a maximum of four pages. An abstract, introduction, and conclusion are not required. Headings for each SLO are required. SLOs may not be combined. The paper should be written in the third person; no personal references (first person pronouns) such as “I” may be used. The content must convincingly illustrate that all SLOs have been achieved. The written report is evaluated as a pass or fail assignment. Examples of reasons why the paper might fail include, but are not limited to, the following:

- Does not address all SLOs.
- Does not provide sufficient examples or evidence to illustrate SLO achievement.
- Illustrates poor mechanics such as significant or distracting errors in grammar or formatting.
- Writes incoherently or informally.
- Does not prove knowledgeable about the meaning of the SLOs.
- Does not participate in peer review or ignores suggestions for improvement during rough draft phase.
- Does not submit the paper on time.
- Engages in academic dishonesty, cheating, or plagiarism which includes having someone else write the paper or make editorial changes. While students will engage in a peer editing session, it is the author’s responsibility to make the changes and address suggestions. Allowing another person to make the changes is not permitted.
Results of the defense will be available in students’ individual folders no later than noon on June 21. Students are responsible for reviewing their folders for the results of the defense. Students who fail the written report defense may engage in a resubmittal process by contacting the instructor no later than 4:00 p.m. on June 21. The student must re-write the failed SLOs and address all components which led to failure. The student must resubmit the report for evaluation by 10:00 a.m. for Section 1 and noon for Section 2 on June 22. If the written report passes at that time, five points will be deducted from the student’s overall grade to compensate for the revaluation process. If the written report fails again, the decision is final and no further action may be taken.

Core Capstone Defense Written Report Rough Drafts
To assist students, rough drafts of the SLOs are due throughout the term. Due dates for the rough drafts of Student Learning Objectives (SLOs) for the Core Capstone Defense are listed in Table 7. Unless otherwise stated, all rough drafts are due in class. Rough drafts should closely follow the requirements for the final draft of the written report. Students must take care not to exceed the length of half of a page for each SLO since the final draft is a maximum of four pages and includes all eight SLOs.

Table 7: Due dates for rough drafts of SLOs.
All rough drafts are due at the beginning of class.

<table>
<thead>
<tr>
<th>Date</th>
<th>Rough draft of SLO #</th>
</tr>
</thead>
<tbody>
<tr>
<td>May 25</td>
<td>5</td>
</tr>
<tr>
<td>May 30</td>
<td>7</td>
</tr>
<tr>
<td>May 31</td>
<td>8</td>
</tr>
<tr>
<td>June 5</td>
<td>1</td>
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<tr>
<td>June 6</td>
<td>2</td>
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<tr>
<td>June 12</td>
<td>4</td>
</tr>
<tr>
<td>June 13</td>
<td>6</td>
</tr>
<tr>
<td>June 14</td>
<td>3</td>
</tr>
</tbody>
</table>

Core Capstone Defense Presentation
Each team will give a team presentation as their Core Capstone Defense Presentation. The presentation is a maximum of ten minutes. Additionally, teams should be prepared to answer questions for up to five minutes following the presentation. Professional attire for the presentation is required. ENGR 301 standards for professional and formal presentations must be met. Each student will select two SLOs (no repeats are allowed) and discuss how those two SLOs were achieved. Students may use diverse approaches: may discuss how a teammate achieved the SLO; may discussed how the team, as a whole, achieved the SLO; may give a personal example illustrate how that student achieved the SLO. The presentation is evaluated as a pass or fail assignment. The assignment will be evaluated individually: if one team member fails, not all team members automatically fail. However, the team needs to give special consideration into ensuring the presentation as a whole is coherent, well-coordinated, and meets ENGR 301 presentation standards. If the team, as a whole, illustrates poor presentation skills, the team will not pass. For example, if more than one member discusses the same SLO, those members will not pass. Examples of reasons why an individual might fail the presentation include, but are not limited to, the following:
• Does not address the assigned SLOs.
• Does not provide sufficient examples or evidence to illustrate SLO achievement.
• Illustrates poor presentation skills.
• Has low quality or ineffective visual aids.
• Presents content incoherently or informally.
• Does not prove knowledgeable about the meaning of the SLOs.
• Does not arrive for the presentation on time.
• Receives negative feedback from the team such as missing rehearsals or other preparation activities.
• Engages in academic dishonesty, cheating, or plagiarism.

Results of the defense will be available in students’ individual folders no later than noon on June 21. Students are responsible for reviewing their folders for the results of the defense. Students who fail the presentation portion of the defense may engage in a resubmittal process by contacting the teaching team no later than 4:00 p.m. on June 21. The student must be prepared to present on June 22 as determined by the teaching team. If the presentation passes at that time, five points will be deducted from the student’s overall grade to compensate for the reevaluation process. If the presentation fails again, the decision is final and no further action may be taken.

Common Errors Leading to Failure
Common errors which lead to defense failure are noted.

Written report has significant and distracting grammar errors. Written report is not drafted using the third person narrative. Written report is not in memo format. Student overexaggerates achievement (use phrases like, “without a doubt,” “more than succeeded,” etc.) creating distrust of the content. Students did not illustrate their own interaction with the material.

Presenter is unable to articulate achievement of the SLO. Poor visual aids are used.

Examples are not diverse (student uses the same example for multiple SLOs). Student does not address all components of the SLO. Student failed to use keywords and relied too heavily upon audience inferring achievement. Student did not provide sufficient evidence or show knowledge of vocabulary used for that topic.

SLO # 1: Students did not illustrate the application of all components (math, science, and engineering). Taking or passing classes is not sufficient proof of applying knowledge. At least one specific example of showing the successful application of each component must be reviewed. Proper vocabulary must be used to show knowledge (e.g., applying math means using equations, processes, and techniques and performing calculations).

SLO # 2: Students did not provide sufficient detail as to the development and creation of a specific experiment. There are specific steps to design an experiment. Those steps and that vocabulary must be used. Students must differentiate between designing an experiment (which is this SLO) and going through the engineering design process (which is not this SLO). Taking or passing classes and labs is not sufficient
proof of designing experiments. Students neglected to discuss what makes high quality data, how to analyze the data, and how to perform error analysis.

SLO # 3: Students failed to give sufficient examples of current issues. Issues which have been present for a hundred years are not contemporary. The SLO requests “issues,” so more than one issue must be discussed. Issues discussed are too closely related to be considered more than one (e.g., solar energy and nuclear power).

SLO # 4: Students failed to give an example of their own specific solution and how that specific solution has impacts. Many students illustrated the impact of problems; however, the SLO requests the impact of solutions. Both the benefits and consequences of the solution must be discussed. The solution must be discussed in terms of global (world), societal (culture, local), economic, and environmental impacts.

SLO # 5: Working on a team and being in teams is not sufficient proof of being able to function well. Examples of how to function on that team and strategies used to be successful are necessary. The tools and resources (charters, schedules, agendas, and meeting minutes) to be successful must be discussed. Students must prove that the team example is multi-disciplinary.

SLO # 6: Students must prove both professional and ethical. Neither passing a quiz on ethics nor participating in class are not sufficient proof. Specific examples of both the successful application of professional and ethical practices must be described. A general acknowledgement that ethics is important is not sufficient. Non-personal examples (examples about someone else committing an unethical act or fulfilling an ethical obligation) are not sufficient. Students failed to distinguish the difference between an ethical example and a professional example. Students failed to illustrate how their ethical decision is defensible by using the Code of Ethics.

SLO # 7: Giving presentations or writing reports is not sufficient evidence of communicating effectively. Proof that the presentations and reports were effective in informing or persuading an audience is required. A discussion of the methods used to ensure effective communication must be included.

SLO # 8: Going to school or having an internship / job is not sufficient to illustrate life-long learning. The learning must be beyond what is required for school or for a job. A general acknowledgement of the importance of life-long learning is insufficient. Clear and specific reasons as to why life-long learning is necessary are required. Specific examples of how the student currently engages in life-long learning activities must be included. Specific examples of how the student will continue to engage in life-long learning activities must be included.
Dear Dr. Bob:

The mechanics of how to write a business letter are detailed. First of all, this business letter will be written in block style. Please notice that everything is aligned to the left of the page.

The business letter begins with the return address. Notice that the name of the sender does not appear. There is a line space, and then the date is inserted. The full date should be given. There is another line space, and the name and address of the receiver are placed in the document. After one more space, the salutation is given. Please note that a colon, not a comma, is used for business letters.

The text of the business letter then follows.

The business letter concludes with closing remarks. Four line spaces are left between the closing and the printed name so that a signature can be placed above the printed name.

Sincerely,

Jane Smith
To: Engineering Communications Class  
From: Candice Bauer (15-6)  
Date: May 22, 2017  
Subject: How to write a memo

The formatting needed to write a memorandum, “memo,” is detailed. Please take note of how the header should appear. The date should be spelled out using standard format. The subject should be informative. For ENGR 301, the section and team number must appear in parenthesis in the From line. For example, “(15-6)” indicates that I am in Section 15 and Team 6. Note the initial next to the sender name; after printing a memo, initialing it is needed to document your approval of the contents of the copy.

Memos can be several pages long. The first page is not numbered, but every page after that should be.

If using the default settings in Word, to get single space for the heading, click on the bottom corner arrow for the Paragraph icons. In the Spacing Section, select “0 pt” for “Before” and “After.” Also, for “Line spacing,” select “Single.”

Traditionally, the memo is written in block style where all of the text is aligned to the left and right.

Memos do not have salutations or closing remarks.

If a memo is mailed electronically, a signature is not needed. If a memo is handwritten, a signature is not needed. If the memo is typed, the sender should initial by their name with a blue or black pen.
Preamble
Engineering is an important and learned profession. As members of this profession, engineers are expected to exhibit the highest standards of honesty and integrity. Engineering has a direct and vital impact on the quality of life for all people. Accordingly, the services provided by engineers require honesty, impartiality, fairness, and equity, and must be dedicated to the protection of the public health, safety, and welfare. Engineers must perform under a standard of professional behavior that requires adherence to the highest principles of ethical conduct.

I. Fundamental Canons
Engineers, in the fulfillment of their professional duties, shall:
1. Hold paramount the safety, health, and welfare of the public.
2. Perform services only in areas of their competence.
3. Issue public statements only in an objective and truthful manner.
4. Act for each employer or client as faithful agents or trustees.
5. Avoid deceptive acts.
6. Conduct themselves honorably, responsibly, ethically, and lawfully so as to enhance the honor, reputation, and usefulness of the profession.

II. Rules of Practice
1. Engineers shall hold paramount the safety, health, and welfare of the public.
   a. If engineers’ judgment is overruled under circumstances that endanger life or property, they shall notify their employer or client and such other authority as may be appropriate.
   b. Engineers shall uphold their own professional documents that are in conformity with applicable standards.
   c. Engineers shall not reveal facts, data, or information without the prior consent of the client or employer except as authorized or required by law or this Code.
   d. Engineers shall not permit the use of their name or associate in business ventures with any person or firm that they believe is engaged in fraudulent or dishonest enterprise.
   e. Engineers shall not aid or abet the unlawful practice of engineering by a person or firm.
   f. Engineers having knowledge of any alleged violation of this Code shall report thereon to appropriate professional bodies and, when relevant, also to public authorities, and cooperate with the proper authorities in furnishing such information or assistance as may be required.
2. Engineers shall perform services only in the areas of their competence.
   a. Engineers shall undertake assignments only when qualified by education or experience in the specific technical fields involved.
   b. Engineers shall not affix their signatures to any plans or documents dealing with subject matter in which they lack competence, nor to any plan or document not prepared under their direction and control.
   c. Engineers may accept assignments and assume responsibility for coordination of an entire project and sign and seal the engineering documents for the entire project, provided that each technical segment is signed and sealed only by the qualified engineers who prepared the segment.
3. Engineers shall issue public statements only in an objective and truthful manner.
   a. Engineers shall be objective and truthful in professional reports, statements, or testimony. They shall include all relevant and pertinent information in such reports, statements, or testimony, which should bear the date indicating when it was current.
   b. Engineers may express publicly technical opinions that are founded upon knowledge of the facts and competence in the subject matter.
   c. Engineers shall issue no statements, criticisms, or arguments on technical matters that are inspired or paid for by interested parties, unless they have prefaced their comments by explicitly identifying the interested parties on whose behalf they are speaking, and by revealing the existence of any interest the engineers may have in the matters.
4. Engineers shall act for each employer or client as faithful agents or trustees.
   a. Engineers shall disclose all known or potential conflicts of interest that could influence or appear to influence their judgment or the quality of their services.
   b. Engineers shall not accept compensation, financial or otherwise, from more than one party for services on the same project, or for services pertaining to the same project, unless the circumstances are fully disclosed and agreed to by all interested parties.
   c. Engineers shall not solicit or accept financial or other valuable consideration, directly or indirectly, from outside agents in connection with the work for which they are responsible.
   d. Engineers in public service as members, advisors, or employees of a governmental or quasi-governmental body or department shall not participate in decisions with respect to services solicited or provided by them or their organizations in private or public engineering practice.
   e. Engineers shall not solicit or accept a contract from a governmental body on which a principal or officer of their organization serves as a member.
5. Engineers shall avoid deceptive acts.
   a. Engineers shall not falsely represent misrepresentation of their or their associates’ qualifications. They shall not misrepresent or exaggerate their responsibility in or for the subject matter of prior assignments. Brochures or other presentations incident to the solicitation of employment shall not misrepresent pertinent facts concerning employers, employees, associates, joint venturers, or past accomplishments.
   b. Engineers shall not offer, give, solicit, or receive, either directly or indirectly, any contribution that could influence the award of a contract by public authority, or which may be reasonably construed by the public as having the effect or intent of influencing the awarding of a contract. They shall not offer any gift or other valuable consideration in order to secure work. They shall not pay a commission, percentage, or brokerage fee in order to secure work, except to a bona fide employee or bona fide established commercial or marketing agencies retained by them.

III. Professional Obligations
1. Engineers shall be guided in all their relations by the highest standards of honesty and integrity.
   a. Engineers shall acknowledge their errors and shall not distort or alter the facts.
   b. Engineers shall advise their clients or employers when they believe a project will not be successful.
   c. Engineers shall not accept outside employment to the detriment of their regular work or interest. Before accepting any outside engineering employment, they will notify their employers.
   d. Engineers shall not attempt to attract an engineer from another employer by false or misleading pretenses.
   e. Engineers shall not promote their own interest at the expense of the dignity and integrity of the profession.
2. Engineers shall at all times strive to serve the public interest.
   a. Engineers are encouraged to participate in civic affairs; career guidance for youths; and work for the advancement of the safety, health, and well-being of their community.
   b. Engineers shall not complete, sign, or seal plans and/or specifications that are not in conformity with applicable engineering standards. If the client or employer insists on such unprofessional conduct, they shall notify the proper authorities and withdraw from further service on the project.
   c. Engineers are encouraged to extend public knowledge and appreciation of engineering and its achievements.
   d. Engineers are encouraged to adhere to the principles of sustainable development in order to protect the environment for future generations.
3. Engineers shall avoid all conduct or practice that deceives the public.
   a. Engineers shall avoid the use of statements containing a material misrepresentation of fact or omitting a material fact.
   b. Consistent with the foregoing, engineers may advertise for recruitment of personnel.
   c. Consistent with the foregoing, engineers may prepare articles for the lay or technical press, but such articles shall not imply credit to the author for work performed by others.
4. Engineers shall not disclose, without consent, confidential information concerning the business affairs or technical processes of any present or former client or employer, or public body on which they serve.
   a. Engineers shall not, without the consent of all interested parties, promote or arrange for new employment or practice in connection with a specific project for which the engineer has gained particular and specialized knowledge.
   b. Engineers shall not, without the consent of all interested parties, participate in or represent an adversary interest in connection with a specific project or proceeding in which the engineer has gained particular specialized knowledge on behalf of a former client or employer.
5. Engineers shall not be influenced in their professional duties by conflicting interests.
   a. Engineers shall not accept financial or other considerations, including free engineering designs, from material or equipment suppliers for specifying their product.
   b. Engineers shall not accept commissions or allowances, directly or indirectly, from contractors or other parties dealing with clients or employers of the engineer in connection with work for which the engineer is responsible.
6. Engineers shall not attempt to obtain employment or advancement or professional engagements by untruthfully criticizing other engineers, or by other improper or questionable methods.
   a. Engineers shall not request, propose, or accept a commission on a contingent basis under circumstances in which their judgment may be compromised.
   b. Engineers in salaried positions shall accept part-time engineering work only to the extent consistent with policies of the employer and in accordance with ethical considerations.
   c. Engineers shall not, without consent, use equipment, supplies, laboratory, or office facilities of an employer to carry on outside private practice.
7. Engineers shall not attempt to injure, maliciously or falsely, directly or indirectly, the professional reputation, prospects, practice, or employment of other engineers. Engineers who believe others are guilty of unethical or illegal practice shall present such information to the proper authority for action.
   a. Engineers in private practice shall not review the work of another engineer for the same client, except with the knowledge of such engineer, or unless the connection of such engineer with the work has been terminated.
   b. Engineers in governmental, industrial, or educational employ are entitled to review and evaluate the work of other engineers when so required by their employment duties.
   c. Engineers in sales or industrial employ are entitled to make engineering comparisons of represented products with products of other suppliers.
8. Engineers shall accept personal responsibility for their professional activities, provided, however, that engineers may seek indemnification for services arising out of their practice for other than gross negligence, where the engineer’s interests cannot otherwise be protected.
   a. Engineers shall conform with state registration laws in the practice of engineering.
   b. Engineers shall not use association with a nonengineer, a corporation, or partnership as a “cloak” for unethical acts.
9. Engineers shall give credit for engineering work to those to whom credit is due, and will recognize the proprietary interests of others.
   a. Engineers shall, whenever possible, name the person or persons who may be individually responsible for designs, inventions, writings, or other accomplishments.
   b. Engineers using designs supplied by a client recognize that the designs remain the property of the client and may not be duplicated by the engineer for others without express permission.
   c. Engineers, before undertaking work for others in connection with which the engineer may make improvements, plans, designs, inventions, or other records that may justify copyrights or patents, should enter into a positive agreement regarding ownership.
   d. Engineers’ designs, data, records, and models referring exclusively to an employer’s work are the employer’s property. The employer should indemnify the engineer for use of the information for any purpose other than the original purpose.
   e. Engineers shall continue their professional development throughout their careers and should keep current in their specialty fields by engaging in professional practice, participating in continuing education courses, reading in the technical literature, and attending professional meetings and seminars.

Footnote 1 “Sustainable development” is the challenge of meeting human needs for natural resources, industrial products, energy, food, transportation, shelter, and effective waste management while conserving and protecting environmental quality and the natural resource base essential for future development.

As Revised July 2007

“By order of the United States District Court for the District of Columbia, former Section 11(c) of the NSPE Code of Ethics prohibiting competitive bidding, and all policy statements, opinions, rulings or other guidelines interpreting its scope, have been rescinded as unlawfully interfering with the legal right of engineers, protected under the antitrust laws, to provide price information to prospective clients; accordingly, nothing contained in the NSPE Code of Ethics, policy statements, opinions, rulings or other guidelines prohibits the submission of price quotations or competitive bids for engineering services at any time or in any amount.”

Statement by NSPE Executive Committee

In order to correct misunderstandings which have been indicated in some instances since the issuance of the Supreme Court decision and the entry of the Final Judgment, it is noted that in its decision of April 25, 1978, the Supreme Court of the United States declared: “The Sherman Act does not require competitive bidding.”

It is further noted that as made clear in the Supreme Court decision:
1. Engineers and firms may individually refuse to bid for engineering services.
2. Clients are not required to seek bids for engineering services.
3. Federal, state, and local laws governing procedures to procure engineering services are not affected, and remain in full force and effect.
4. State societies and local chapters are free to actively and aggressively seek legislation for professional selection and negotiation procedures by public agencies.
5. State registration board rules of professional conduct, including rules prohibiting competitive bidding for engineering services, are not affected and remain in full force and effect.
6. As noted by the Supreme Court, “nothing in the judgment prevents NSPE and its members from attempting to influence governmental action . . .”