GE 3513 Technical Writing Assignment Information

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GE 3513 Major Writing Assignments (Papers)

PAPER 1 (this is an individual assignment)
For paper 1, write a minimum two-page technical description of a concept, process, or device from your field of study. This description should be written for an educated lay audience, one that possesses no specialized knowledge of your field of study or the specific subject of your document. Other guidelines follow.

Content

1. Write only on a subject about which you already know something. Writing on a brand-new subject (a) will take far too long, and (b) will necessitate too much reliance on sources. You can use sources for this paper if you wish, but these sources should be used sparingly and should only reinforce your description. Your paper should not be a collection of paraphrases and quotes.
2. In accordance with your targeted audience, make sure you address the significance of your topic – in other words, make sure you answer the question, *"Why should anyone care about this subject?"*
3. Make sure you provide sufficient details about your subject. Consider every possible angle: What are its physical dimensions? How many steps are in the process? Who first explored this idea? Etc.
4. Include at least one graphic illustrating your subject in some way, and make sure you integrate this graphic appropriately: a reference to the graphic in your text, a label (e.g., "Figure"), a number ("1"), a title ("The Bagley College Logo"), and a source citation ([1]) if the graphic is not yours, as in the example below.

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Figure 1. The Bagley College Logo [1]

TOPIC OPTIONS for PAPERS 2 & 3 (these are collaborative assignments)

For papers 2 and 3, choose ONE of the following topic options.

Option 1	*Option 2*
Write a report discussing research and/or an experiment someone in your team has conducted him/herself. Any research or experiment selected for this assignment should be rooted in engineering concepts in an engineering field, and at least one member of your team should have	Analyze and discuss a specific engineering ethical issue or problem while paying close attention to documented communication and engineers' and managers' actions prior to the problem. Some possible issues include the space shuttle Columbia

been part of the research/experiment him/herself. You may not simply read about someone else's work and write about that work for this paper. You must also submit any lab reports and other original documentation regarding the research/experiment about which you choose to write your article. Also note that **you may not simply resubmit a previously written document – your use of prior work must involve substantive revision and modification.** **NOTE:** If in choosing this option you wish to use part or all of a document you wrote in a previous course, you MUST obtain permission both from me and from the instructor of record for the previous course. Failure to do so can result in charges of academic misconduct. (See policy number 8 in the "POLICIES" section of our course syllabus.)	disaster, the Therac-25 accidents, and the I-35 bridge collapse. For a more extensive list of ethical issues, go to www.onlineethics.org. **CAUTION**: for fall 2009, no one in GE 3513 may use the Challenger disaster as a paper topic.

FORM AND CONTENT

Paper 1 is self-contained. Paper 2 is the first draft/iteration of paper 3, meaning papers 2 and 3 are directly related and that paper 3 builds upon the work you did writing and revising paper 2. **All papers must be formatted according to "11.6 Primary Research Reports" in *A Writer's Handbook for Engineers*. All references must be formatted according to "12.1 IEEE Style of Documentation" or "12.2 APA Style of Documentation" in this same book.** No other formats are acceptable for these assignments.

1. The content for **paper 2** must consist of at least the first two pages of what will eventually be paper 3: the **Abstract**, the **Introduction**, and whatever content comes next. You may include as many sections as you wish for paper 2. This paper should be a working draft of the final version you will submit for paper 3. Paper 2's final length will vary depending on how many report sections you include, but it should be **at least** 2 full pages long.

2. The content for **paper 3** is the full report – **Abstract** through **References** – incorporating revisions made in the process of writing paper 2. The final version must be at least 8 full pages long from the **Abstract** through **References**.

Typefaces, Margins, & Spacing: All papers must be in 12-point Times New Roman or Arial fonts; smaller fonts are appropriate for figure captions and text inside figures. All margins must be 1" all around (note that old versions of Word typically default to 1.25" for left and right margins, so you will need to change these). All papers should be single spaced.

Ensure that your paper has a well-defined point/thesis – a statement somewhere in the introduction that conveys to the reader precisely what your *subject* is, what your *position* is, and how you proceed to *support* this position. Remember that a thesis is a promise to the reader that you're going to discuss one specific main idea; the rest of your paper is how you go about keeping that promise. Every paragraph and section should be obviously related to the thesis; every paragraph and section should be obviously related to each other; every sentence in a paragraph should be obviously linked to each other and should obviously refer back to its paragraph's topic sentence.

Remember too that your audience for papers 2 and 3, though educated, possesses no specialized knowledge of your research/experiment or of the ethical situation you're discussing; this fact means you must provide either a brief but thorough technical explanation of your research or a technical explanation of what happened in your chosen scenario (defining any technical terms), either of which should be written in clear, precise language.

You must also include at least one graphic and cite several references in your paper. The graphic(s) must serve a substantive purpose; they should not merely be space-filling eye candy, meaning you must think carefully about what areas of your content might be helped by visual representation and what types of graphics (photos, diagrams, tables, charts, etc.) will most effectively accomplish your purpose. These graphics may certainly come from outside sources as long as you cite them appropriately. If you modify a graphic in any way, your citation should reflect changes made. Your sources are necessary to provide authoritative support for your ideas and to give credit for supporting ideas that don't belong to you. Use either the IEEE or APA styles of documentation as set forth in chapters 12.1 and 12.2 of *A Writer's Handbook for Engineers* to format your in-text citations and **References** section.

RESOURCES & RELEVANT LINKS

- http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/ethics.pdf: basic information on engineering ethics and codes of conduct
- http://www.onlineethics.org/: a good background on the Challenger situation from an engineering perspective; to find Challenger-specific content, enter "challenger" in the search box in the upper-right-hand corner of the page and click "Search."
- *Report to the President by the Presidential Commission on the Space Shuttle Challenger Accident*: volumes I, IV, and V available for checkout from Mitchell Memorial Library; the complete online version is available at http://history.nasa.gov/rogersrep/genindex.htm; the "Appendix D: Supporting

Charts and Documents" section of this online report contains scanned images of nearly every significant Challenger-related document.

- http://www.hq.nasa.gov/office/pao/History/transcript.html: the actual transcript of the Challenger crew as recorded during the 73-second launch sequence; note the chilling last two lines.
- http://science.ksc.nasa.gov/shuttle/missions/51-l/docs/rogers-commission/Appendix-F.txt: a series of personal observations by Richard Feynman, the late Caltech physicist and member of the Rogers Commission
- R. Boisjoly, dir. *An Ethics Case Study – The Chronological Presentation of the Space Shuttle Challenger Disaster.* DVD. n.p.: Roger Boisjoly, 2005: Boisjoly was the chief whistleblower at Morton-Thiokol during *Challenger* – we will watch most of this presentation in class.
- M. Maier, dir. *"A Major Malfunction…": The Story Behind the Space Shuttle Challenger Disaster*. DVD. n.p.: Mark Maier, 1992: we will also watch large portions of this very thorough documentary in class – in particular, it contains footage of Rogers Commission testimony by some of the key people involved with Challenger.
- http://www.nasa.gov/: the official NASA website
- Edward Tufte, *Visual Explanations: Images and Quantities, Evidence and Narrative*: available for onsite use in McCain 202; contains a detailed section on Challenger and, in particular, on the pre- and post-disaster engineering charts used to discuss the O-ring problem
- Paul Dombrowski, *Ethics in Technical Communication*; 1 copy available for onsite use in McCain 202
- Mike Martin and Roland Schinzinger, *Ethics in Engineering*, 3rd ed.; 3 copies available for onsite use in McCain 202

RULES AND REQUIREMENTS

- Write only on one of the topics described above. Topical variations will result in penalties ranging from the loss of a letter grade to a permanent zero.
- Adopt and maintain a formal, professional writing style and tone. Avoid slang, contractions, emotional writing (thinking, not feeling), and second person ("you"). Use first person ("I") only with purpose and caution. Look to good models for examples, such as the sample paper listed below; also, any article published in a professional, refereed journal is probably a good example of what that journal's editorial board wants and likes.
- Be afraid of abstraction and vagueness. Be keenly aware of the difference between fact and opinion, know when you're supplying each, and understand that you must be able to defend every opinion or assertion you offer. It is never enough simply to state an opinion as if readers should accept what you say on faith; you, as a writer, are always responsible for supporting the claims you make.
- Any text or images borrowed from the list of resources above and used in your paper must be cited as a source. Failure to cite such uses properly can give the impression of plagiarism, which can lead to an F in the course.

- Be smart: do not use another student's paper as your own, and do not consult any of those ridiculous research-paper websites for "help" with this assignment. Either of these infractions will result in an F for the course and a report filed with the Dean of Students. Ensure that you understand plagiarism as defined by our course's website.

SAMPLE PAPERS

WARNING: The formatting for these sample papers is different than the one you are required to use this semester. Do not follow the samples' formatting in your own paper.

1. Sample Technical Description 1
   http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/sampletechdesc.pdf and 2
   http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/sampletechdesc2.pdf

2. Sample Research-Based Paper
   http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/brocato/sampleresearchpaper.pdf

3. Sample Conference Paper
   http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/brocato/samplepapersdtw.pdf

Although these sample papers' topics may be different than yours, notice the quality and flow of the writing, the substantial use of outside sources as support for the writers' arguments, and the papers' logical and reader-friendly organization schemes. Use these characteristics as models for your own writing.

WARNING: Under no circumstances are you allowed to copy sentences, long phrases, or excessive formatting elements from these samples for use in your own slides. Such copying is plagiarism.

GE 3513 Presentations

Presentation 1 (time limit: 8 to 10 minutes)
For presentation 1, your team must present on one of your teammates' description topics from paper 1.

Major Issues to Consider in Creating Presentation 1

- *History* – How did the device or process evolve? How old is it?
- *The Description Itself* – How does the device or process work?
- *Implementation* – How/when/where/why is the device or process used?
- *Significance* – Why is the device or process important?
- *Images* – What does the device or process look like?

Post Presentation 1 DVD Assignment:
As part of your preparation for presentation 2, perform the following tasks with the DVD of presentation 1 you made in class:

1. Watch the entire DVD as a team (presentation + Q&A).

2. Write an e-mail to your instructor describing your reactions to what you saw on the DVD and how you anticipate your viewing of this DVD to help you work toward presentation 2 (and hopefully future presentations outside my class). This e-mail need not be an attachment or be formatted in a specific, formal way; specific written text will suffice.

Presentation 2 (time limit: 12 to 18 minutes)
For presentation 2, your team must present on one of the options for papers 2 and 3 (individual research or professional ethics).

Resources & Relevant Links
In addition to the resources and links provided on the paper information page, the following may be useful to you in creating your presentation.

- Effective Technical Presentations (http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/efftechpres.ppt) – This presentation discusses many of the basic components of an effective presentation.
- Dr. Miriam Smith's Slides on Delivering Successful Presentations (http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/smithslides.ppt) – Dr. Smith's superb presentation covers many of the same strategies as the one above but from a perspective more entrenched in technical CEE content.
- Sample student presentation (http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/brocato/SampleColPres.ppt) – This PowerPoint file is an excellent example of overall slide layout and design.
- Virginia Tech's Slide Templates (http://www.writing.eng.vt.edu/slides.html) – Although they do employ PowerPoint, Virginia Tech's templates for presentation slides challenge the standard bullet-point mindset of PowerPoint and can result in highly effective presentations.
- "Garbage Dump in the Sky: Space Debris and Its Impact on Space Operations" (http://gammaray.nsstc.nasa.gov/colloquia/abstracts_spring06/bcooke.html) – (The link shows the presentation abstract and contains a link to the slideshow itself). In addition to its complexity, attractiveness, and interesting-ness of topic, this slideshow contains many examples of effective and ineffective presentation elements (i.e., things you should do and things you definitely should NOT do).
- Edward Tufte's "PowerPoint Is Evil" (http://www.wired.com/wired/archive/11.09/ppt2.html) – The title says it all. While Tufte's opinions can seem excessively harsh, he does make timely points about common pitfalls of PPT.

WARNING: Under no circumstances are you allowed to copy sentences, long phrases, or excessive formatting elements from these samples for use in your own slides. Such copying is plagiarism.

FORM AND CONTENT

Length: Presentation 1 must be **8 to 10 minutes long;** presentation 2 must be **12 to 18 minutes long**, not counting the Q & A sessions. Because of our constrained schedule, I will be strict about keeping you within these time limits.

Teamwork: All members of your team must play a substantial and equal role in these presentations and its preparation. Refer to the "Collaboration" and "SLACKERS BEWARE!" portions of the course syllabus for information on the importance of your team's working relationship and its potential impact on your team's grade for the presentation.

Speaking style: We will discuss the elements of effective speaking at length in class.

Audience: Your audience for this presentation is educated but possesses no specialized knowledge of the technology/research or of the ethical situation you're discussing, which means that you must provide brief but thorough explanations of technical concepts and definitions of technical terms.

Slides: Your presentation must contain PowerPoint slide shows to support your team members' discussion. These slide shows need not follow dictated formats, meaning your team is free to design the slides as you see fit. However, presentation slides should definitely be designed according to specific guidelines. You can read about some of these guidelines on pages 563-569 of our textbook and see examples of them in the sample presentations above; we will also discuss these guidelines at length in class. Also, if you use borrowed information (text or graphics) on your slides, you must provide source citations and a **References** slide (just as you do in written documents) formatted according to the IEEE or APA styles of documentation as set forth in chapters 12.1 and 12.2 of *A Writer's Handbook for Engineers*.

RULES AND REQUIREMENTS

- Present only on one of the topics described above. Topical variations will result in penalties ranging from the loss of a letter grade to a permanent zero.
- Adopt and maintain a formal, professional speaking style and tone. Avoid slang, nonfluencies, emotional words (*thinking*, not feeling), and second person ("you"). Use first person ("I") with purpose and caution. Look to good models for examples, such as the samples linked below.
- Be afraid of abstraction and vagueness. Be keenly aware of the difference between fact and opinion, know when you're supplying each, and understand that you must be able to defend every opinion or assertion you offer. It is never enough simply to state an opinion as if the audience should accept what you say on faith; you, as a presenter, are always responsible for supporting the claims you make.
- Be smart: do not use other students' presentations as your own, and do not "borrow" any from the Internet. Either of these infractions will result in an F for the course and a report filed with the Dean of Students. Ensure that you understand

plagiarism as defined by our course's website, since plagiarism can also apply to presentation slides.

- On days when you do not present, you must still come to class to serve as the audience for your colleagues and to complete review forms (http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/presreviewform.pdf) for their presentations. Failure to attend these presentations will cost you one letter of your own individual presentation grade.
- You may practice your presentations in McCain 215 when classes are not in session. To avoid scheduling conflicts, please plan ahead and see me for an appointment.

GE 3513 Final Exam Information

WHAT'S THE FORMAT?
The exam will require you to write a short technical document based on a problem description similar to the cases used for in-class projects. ***You need to bring your own copies of our textbook and a dictionary in order to write this exam.***

WHAT DOES THE EXAM COVER?
The exam will cover most of the concepts we discussed and used this semester. Although the exam is open book, I recommend reviewing our assigned readings so that you are able to use the following ideas effectively in writing a document:

- Analyzing your audience and purpose and suiting your writing appropriately
- Writing coherent, effective, appropriately emphasized sentences and paragraphs
- Creating a sound modular design for your document via appropriate sections, headings, lists, and graphical elements (mere paragraphs in an essay-type format are **not** appropriate for this assignment)
- Organizing and writing professional correspondence
- Remaining ethical in your handling and presentation of facts
- Using correct grammar and a suitable professional writing style

HOW MUCH IS THE EXAM WORTH, AND HOW WILL IT BE GRADED?
The exam is worth 15% of your overall grade (or 150 points out of a thousand) and will be graded using the same criteria used for paper assignments during the semester.

WHAT CAN I USE IN TAKING THE EXAM?
In taking the exam, you need your textbook as well as a book-style dictionary, but these must be **your** books – no sharing during the exam whatsoever. You may not use any other outside materials (class notes, old papers, etc.). You will also need a pen or pencil and your own paper. Except for a stand-alone calculator, **you may not use electronic devices of any kind during the exam**; this includes laptops, spellcheckers, cell phones, PDAs, and anything else electronic not already mentioned. Also, you **must** turn the exam problem description back in with your written exam; failure to do so will result in an exam grade of zero.

WHAT'S THE OBJECTIVE?

In evaluating your exams, your instructor will look for convincing evidence that you can take a specific writing situation and generate a document that is accurate, thorough, ethical, purposeful, well formatted, reader friendly, grammatically/stylistically sound – in short, effective technical writing.

TIPS

- Read the problem description several times, highlighting facts and taking notes. Make sure you fully understand what you're supposed to do.
- **Leave time to proofread**; reserve 15 to 30 minutes of the exam period for going over your report (with your books) and looking for factual errors, stylistic problems, document design weaknesses, poorly structured and developed paragraphs, grammatical errors, misspellings, etc.
- Pace yourself; don't spend too long on any one task unless it's proofreading **after** you've finished writing. Don't worry about writing separate rough and final drafts: you probably won't have time.
- Neatness only counts if your instructor literally can't read what you've written, but **do not** let your revising hinder your document's format; maintain structure, spacing, and clarity.
- Since you'll be writing by hand, use capital letters, underlining, or darker ink for emphasis instead of bold or italics.
- Do not show up late for the exam; do not miss the exam, since it's part of policy 1 in the syllabus and **must** be completed for you to have a chance at passing the course.

Sample Exam Prompt – The Pendergrass Circuits E-mail

You are an engineer at Pendergrass Circuits Inc., a small electronics company in Random Lake, Wisconsin. One Wednesday evening at 8:33, while checking your company e-mail account from home, you receive an e-mail message from your fellow engineer Bart Sellers. The message reads as follows:

> We've got a problem. I missed my connecting flight. I'm stuck here in the Lincoln, Nebraska airport. I'm sending you this on the company laptop. Koenig is going to fire me when he finds out, but it really wasn't my fault. I got a taxi and was on my way to the airport to catch my flight to Sallisaw, Oklahoma to install replacement chips on some recalled PGS-480 boards when the taxi driver gets a message on his radio that his wife's just gone into labor – so he floors it for the hospital. I started asking him what he was going to do about me, but all he kept saying was "I'm having a baby!" He disappeared inside when we got to the hospital. I went and looked for him but I couldn't find him. So I went back out to the taxi and tried to radio the dispatcher for help, but I couldn't figure out how to make it work. It was 5:58. My plane was leaving at 6:35. Then I saw the keys in the ignition. I didn't know what else to do, so I got in and tried to drive to the airport, but I got lost because I don't know Lincoln too well and I still couldn't figure out how to work the radio. A rancher near the Kansas border finally told me how to get to the airport, but I didn't get parked and into the terminal until 8:07, and the next flight to

> Sallisaw on any airline doesn't leave until 7:55 tomorrow morning. Which will put me into Sallisaw at 11:05, but I'm supposed to be at the customer's office at 9 AM. I tried calling them but there was no answer and no voice mail and I don't have an e-mail address for them. Can you call them and reschedule the installation? The customer is Darwin Aero Works in Sallisaw, Oklahoma. The address should be in the Darwin file. Tell Koenig that I'll take responsibility for the taxi thing if there's trouble. Reply as soon as possible and let me know you got this. Later.

After replying to Bart's e-mail, you find that there is indeed no answer at Darwin Aero Works (although they do have voice mail), and you know from experience that Darwin rarely answers e-mail (although they do have a working e-mail address). Rex Koenig, your boss, is two hours away by car at an IEEE dinner, and your calls to his cell phone have gone unanswered (although he does have voice mail); he apparently cannot be reached until he gets to work at 8:00 a.m. tomorrow. Furthermore, you are leaving tomorrow at 5:30 a.m. on a six-hour flight to Nova Scotia to assist a new customer with an installation.

ASSIGNMENT: Write the documents that you think are necessary in this situation. Format your letter according to "13.2 Types of Business Messages" in *A Writer's Handbook for Engineers* (the GE 3513 textbook). All the content you need to write this report should be present on this sheet of paper; however, if you happen to know something specific about this topic that will help your writing/solution, feel free to add such information as long as you do not modify the scenario in any way. Although you are free to use the content above without citation (since, in the context of the case study, it's presumed to be your own work), be careful not to simply cut and paste phrases and sentences without modifying them so they suit your writing and the situation well. Make sure you explain any assumptions you make about incomplete story details (these assumptions should obviously be exceedingly logical). Consider well which details are essential and which ones are not. Think carefully about what your responsibilities are in this situation as well as to whom you are responsible. Do not waste time worrying about anything "farfetched" – handle the problem as it lies. As explained in class and on the online exam-information page, you must write this exam by hand (no typing or laptops) using either pen or pencil and any type of paper; also, the only acceptable outside resources you may use are *A Writer's Handbook for Engineers* and a book-type dictionary (no sharing with other students). Lastly, you MUST turn this sheet back in with your written exam – failure to do so will result in a zero on the exam (and yes, you may write/make notes on this sheet).

Electrical and Computer Engineering Section Information

Minor Deliverables

First Minor Deliverable – Problem Statement

NOTE: The instructions in the box below apply to all written minor and major deliverables.

DEADLINES AND PEER-REVISION INSTRUCTIONS: Your group must post your first draft to your group's project website by 10am the day prior to the peer-revision session. This is so your partner group's members have plenty of time to review your draft outside of class, and you will reciprocate with their draft. To receive credit for the peer-revision exercise, each student must print out and comment upon his/her group's assigned partner's draft and bring the hard copy to

class and then participate in the peer-revision session. I will check your draft to make sure you have thoroughly proofread it. Final drafts are due electronically (posted to your team's website, uploaded to Turnitin as a Word 2000+ or PDF attachment, and e-mailed to me in one of those same formats).

The following is based on the directions for design-document sections found at http://www.ece.msstate.edu/courses/ece4512/. In writing this and all Senior Design I documents, please note that, ultimately, people will read the final design document after the project is finished. Therefore, write the design document in present or past tense (depending on each section), not in future tense (e.g., **NOT** "This product will outperform its competitors by…."). Also, I suggest that you read several of the problem statements from last semester's SD I groups to get a good understanding of what Dr. Reese and I expect from your document.

1. Problem (Minimum Length: Two Single-Spaced Pages)

In this section, your group will define the problem you are addressing, explain its significance, and discuss the impact of your solution (not how you are going to solve the problem, but what will happen if you solve the problem. **This document should not include specific technical details about your approach.**). Start with a general problem overview, background, etc., and then get progressively more detailed. This section should consist of four parts:

- *Historical Introduction*: includes an overview of the general technical area you are researching, as well as any societal context impacting this project. (For example, many new products and business opportunities have resulted from significant legislation such as the American Disabilities Act of 1990. A project in this area that was impacted by this legislation should spend time discussing this.) At the end of the historical introduction, include a few sentences to tie this section into your project's overall subject/purpose, basically answering the question, "So what?"
- *Market and Competitive Product Analysis*: includes a market analysis (i.e., Who would want to buy your product? How many people would want to buy it?) and a competitive product analysis (i.e., What other products like yours exist? How much are they? How is your product different?). **Directions for SECON groups**: Instead of writing a market and competitive product analysis, each SECON group will analyze strengths, weaknesses, and threats, answering the following questions: What do you see as the particular strengths/weaknesses of the MSU team in relation to this competition? What threats to success do you see in terms of the competing teams (rules, other factors, etc.)?
- *Concise Problem Statement*: consists of two parts: (1) a one- to two-sentence description of the fundamental problem you are attempting to solve that will enable the market you have previously identified, basically stating the flaws in current products on which your design seeks to capitalize; (2) a general but quantitative technical formulation of no specific length of the problem (e.g., must compress a feature-length movie into one 4 Gbyte DVD). Please keep marketing statements like "Our product is super-duper-wonderful!" out of this section – stick to the facts.
- *Implications of Your Success*: describes how this product will be used if you are successful, how much of the market you might capture for a certain level of performance, etc. For example, if you build an audio amplifier for $100 that outputs 500W, how much of the market for audio amplifiers would you expect to capture? Also, think about any wider changes that will occur if your product is successful. For example, Apple's introduction of iTunes had a significant impact on market sales in traditional music stores. It also had a societal impact in that it helped reduce illegal music sharing: people could now buy individual songs instead of having to purchase an entire album. There is a temptation in this section to simply restate what you have already said using different wording. This section should contain NEW content and not reworded old content.

The final draft of the problem statement should have inline citations (e.g., "Previous approaches resulted in systems whose power consumption was excessive [23].") and should conform to IEEE formatting guidelines for references. Your problem statement is building upon a vast body of engineering knowledge, most of which you have drawn from other resources that must be cited. Source use and IEEE style will be thoroughly discussed in class.

Tone:
SD documents are formal, meaning you should avoid using contractions, cliché expressions, slang or casual expressions, and second person ("you," "your," "yourself," etc.), which are characteristic of informal writing. First person ("I," "me," "we," "us," "my," "myself," etc.) is not strictly forbidden in formal documents, but you should avoid it in SD documents. Use third person ("This product involves…") and, if necessary, passive voice ("The device was evaluated by…").

As a general rule, you should write more formally than you speak in everyday conversation. It is preferable to come across as a little too stiff than a little too loose. Having said this, however, please note that writing formally does not mean using long sentences and complex words (which students often call "five dollar words"). Above all, the most important characteristics of effective technical communication are clarity and readability.

I suggest you read several problem statements from last semester's SD I groups' documents to get a better understanding of the assignment. Note, however, that if a sample document violates guidelines that Dr. Reese or I have given you this semester, then follow our guidelines instead of the sample. As always, do not "borrow" passages or sentences from another group's document, since such "borrowing" constitutes plagiarism.

Second Minor Deliverable – In-Class Ethics Presentation

For your second minor deliverable, your team will give an 8-10-minute in-class presentation on one of two topics: (1) the space shuttle *Challenger* document assigned below; (2) an ethical issue of your choice within electrical/computer engineering. The document assignments for option 1 are as follows:

- Team 1: document 1 / Ray briefing chart (http://history.nasa.gov/rogersrep/v1p233.htm)
- Team 2: document 3 / second Miller-Ray memo (http://history.nasa.gov/rogersrep/v1p236.htm)
- Team 3: document 6 / first Boisjoly memo (http://history.nasa.gov/rogersrep/v1p249.htm)
- Team 4: document 15 / Kilminster fax (http://history.nasa.gov/rogersrep/v1p97.htm)

CONTENT CRITERIA FOR THE *CHALLENGER* OPTION
Readers: who were the short- and long-term readers?

Context: in what sort of political/social/cultural/professional environment were these memos written?

Chains of command: what were the writers' limitations on both recommending actions to others AND taking actions themselves?

TC basics: how sound are the documents' diction, sentence & paragraph structure, overall document design, grammar, clarity, etc.?

General: what are your conclusions about why your particular document did nothing to stop the launch until the design in question could be fixed?

CONTENT CRITERIA FOR THE ECE OPTION
Historical context – Summarize the details and/or events in your chosen topic, briefly discussing (as necessary) the history of the organizations and individuals involved.

Technical description – Describe the technical problem, issue, or breakdown at the heart of your chosen topic; from a technical perspective, what went wrong, or what is the issue?

Ethics component – Discuss the extent to which professional ethics plays (or played) a role in your chosen topic. Ground your discussion in specific ethical standards, especially the IEEE Code of Ethics (http://www.ieee.org/portal/pages/iportals/aboutus/ethics/code.html); see also http://www.onlineethics.org/ and http://ethics.iit.edu/.

Communication component – Discuss the extent to which communication plays (or played) a role in your chosen topic. Consider effective/ineffective and ethical/unethical communication practices as espoused in our textbook, our class discussions, and elsewhere.

All team members must speak during your presentation. Provide some sort of visuals to support your talk (showing your assigned *Challenger* document onscreen, for example, could suffice). Your grade for this presentation will be based on (a) your obvious knowledge of the subject; (b) your substantial and insightful commentary on your topic, including addressing the criteria above; and (c) your adherence to the characteristics of effective speaking (eye contact, enthusiasm, vocal poise, etc.) as discussed in class. I will use our presentation review form (see the course website) to evaluate your presentation.

Third Minor Deliverable – Executive Summary

The third minor deliverable requires that each group write its design document's executive summary (ES). An ES is a mini-version of the entire document and is geared toward managers or executives who may not have time to read a lengthy document; therefore, ESs contain the most important information from the document. Note, however, that ESs should be carefully rewritten summaries of a larger document; they should not merely be collections of sentences that have been cut-and-pasted verbatim from other sections, which often produces choppy, fragmented writing.

The ES must be exactly one single-spaced page long – no more, no less. It must consist of four paragraphs. The first paragraph contains an overview of the problem. (What need does your design address?) The second paragraph contains an overview of the design constraints. The goal of this paragraph is to ensure that the reader understands the key design challenges you faced. The third paragraph contains an overview of the approach you took to solve the problem. Describe how you have met your design constraints. (The second and third paragraphs are the longest paragraphs of the four.) Finally, the last paragraph contains an overview of the novelty of your design. This is a fairly short paragraph that summarizes innovation in your project (what makes your design unique, what can be done to improve your design, what are the impacts of your design's success, etc.). The fourth paragraph should be about four sentences. The ES must also include one highlight graphic that motivates the reader and is simple but meaningful to the entire summary. The graphic is actually **the most critical part of the executive summary** and should be a conceptual diagram from which the reader can grasp the

functionality of the product and its usage in a wider context. A reader will first look at the graphic, then skim the text to determine how the elements of the graphic are explained in the text.

I recommend reading a few executive summaries from last semester to see how the authors executed these components and how their strategies might benefit your document. Note, however, that if a sample document violates guidelines that Dr. Reese or I have given you this semester, then follow our guidelines instead of the sample. As always, do not "borrow" passages or sentences from another group's document, which constitutes plagiarism.

Major Deliverables

First Major Deliverable – Design Requirements/Constraints

The following is based on the directions for design-document sections found at http://www.ece.msstate.edu/courses/ece4512/. SD I documents must be written in present or past tense (depending on each section), not in future tense (e.g., NOT "This product will outperform its competitors by…."). Also, I strongly encourage you to read several of the design constraints sections from last semester's SD I groups' final documents to get a good understanding of what Dr. Reese and I expect from your document.

2. Design Requirements (Minimum Length: Three Full, Single-Spaced Pages)

The design requirements section is perhaps the most important section of the design document because it defines the constraints for the group's design. Everything students do in senior design centers on these constraints. Later, the approach section will describe how you built/are building your prototype to meet these constraints, and the evaluation section will then describe the tests used to ensure your prototype met the design constraints.

IMPORTANT NOTES: Focus on the constraints themselves, not on the group's approach; in other words, **avoid discussing the specifics of how you are designing your prototype in this document -- write instead about the considerations that lead to (constrain) your particular design.** Think about why you chose a constraint and why it is important that you meet it. In your paragraph description of each constraint, tell the reader the reasoning behind the constraint. If your constraint says, "The device has a measurement accuracy of 0.1 V," then tell the reader why you chose 0.1 V and not 0.5 V or 0.2 V. This is a good place to use equations or external references to provide a justification for the constraint. If you cannot justify why you have chosen a particular number in a constraint, or the reasons for including the constraint itself, then your understanding of the problem is faulty. Also, note that statements like "The device runs for X number of hours using a lithium-ion battery" are also erroneous because "lithium-ion" refers to approach. Instead, think about the constraint itself: If you want the device to run for X hours using a battery, then that is your design constraint. The type of battery you choose to meet that constraint—such as a lithium-ion battery—should be discussed in your approach document.

Some teams have projects that are subsystems within a larger system (e.g., an autopilot for an airplane). The constraints ***must relate to what your team is working on***, and not the larger system. Undoubtedly, there are constraints for the larger system that your subsystem will affect, but these constraints will also be affected by subsystems other than yours. So, instead of providing the constraint for the larger system, provide the constraint for your subsystem that will ultimately impact the constraint for the larger system. For example, a constraint on a car may be that it must be able to accelerate from 0 to 60 in 7 seconds. If you were designing the fuel injector, then you would have a constraint "must provide X amount of fuel

per second." The designers of the drive train would have their own constraints. The result of all of these subsystems working together (and meeting their constraints) would be a car that can accelerate from 0 to 60 in 7 seconds.

The format for this section is as follows:

Include an introductory paragraph(s) that provides continuity and flow to the document, briefly reiterating what your product is and what purpose(s) it is intended to serve. The introduction to this document should also note that the document is divided into two major sections: technical design constraints and practical design constraints.

Section 2.1: Technical Design Constraints

Each team must have five technical design constraints that adequately constrain the circuit and software design of the system. Technical design constraints typically relate to the performance of the system. List and briefly describe your five technical design constraints using a table like this one, only with five rows instead of four:

Table 1. Technical Design Constraints

Name	**Description**
Signal-to-Noise Ratio	The product achieves a signal-to-noise ratio of 30 dB or greater and, therefore, outperforms existing technology on the market.
Accuracy	This system's incorrect classification rate does not exceed 3.5% on data whose SNR exceeds 15 dB.
Robustness	The imposter acceptance rate does not exceed 3% on data whose SNR exceeds 10 dB.
Transmission Distance	The base station communicates with the server at a maximum distance of 100 feet with a maximum bit error rate of 1e-05.

Follow this table with several paragraphs explaining these design constraints in detail. Typically these are explained in groups since design constraints are often interrelated. Use constraints that relate to well-known standards (such as UL or FCC specs), and be sure to explain these specifications. **Technical design constraints must be quantitative and must be testable.**

Section 2.2: Practical Design Constraints

The ABET handbook on accrediting engineering programs states the following:

> Students must be prepared for engineering practice through the curriculum culminating in a major design experience based on the knowledge and skills acquired in earlier course work and incorporating engineering standards and realistic constraints that include most of the following considerations: *economic; environmental; sustainability; manufacturability; ethical; health and safety; social; and political*.

Choose five of the categories above as practical constraints (you may consider "health" and "safety" as either two separate categories or one combined category), and list and briefly describe them as in the table below, with five rows instead of four:

Table 2. Practical Design Constraints

Type	Name	Description
Economic	Cost	The expected retail for this price is $100 based on a parts cost of $25.
Sustainability	Reliability	This system is designed to operate over a five-year period without failure. The expected battery life is seven years, and the battery is the only part requiring regular maintenance.
Manufacturability	Size	The physical dimensions are 3" high, 4" wide, and 6" deep.
Health and Safety	Safety	The product conforms to UL Specification 631, which requires that this unit not deliver an electrical shock to the user under..., and UL Specification 837, which....

After you provide these constraints, some detailed explanation will be required, as in Section 2.1.

Second Major Deliverable – Approach

LENGTH REQUIREMENTS AND TARGET AUDIENCE: For the rough draft, each group must submit a minimum of seven full, single-spaced pages (Times New Roman, 11-point, left-justified text that conforms to the template guidelines). For the final draft, the minimum length is ten full, single-spaced pages, and the maximum length is 25 pages. This document should not target lay readers but rather fellow ECE students (i.e., people whose knowledge levels are similar to your own).

3. Approach

The following is based on the directions for design-document sections found at http://www.ece.msstate.edu/courses/ece4512/. For this section of your senior design document, you are allowed to use past tense (as necessary) and first person (as necessary). As with all assignments, I strongly encourage you to read several of last semester's SD I groups' documents to get a good understanding of what Dr. Reese and I expect from your document.

Dr. Reese's requirements for the content of the approach section are specified below:

Begin the approach section with a paragraph that provides a general overview of your design, thus providing continuity and flow of this section with the preceding sections (similar to what you did for paper 1).

The approach document discusses, in great detail, the **hardware** and **software** subsystems used in your design to meet the technical and practical design constraints of your project.

Hardware

For the hardware subsystems, you must discuss the different approaches to the key technological elements of your design and their **tradeoffs**. In discussing the tradeoffs of each technological approach, present enough **background theory** on each approach so that the reader becomes familiar enough with each approach to understand your **justification** for selecting a particular approach. To reiterate, for the major hardware subsystems in your design used to meet the technical and practical constraints of your design, you must present the theory behind the different technological approaches, the tradeoffs associated with each approach, and your justification for selecting a particular approach. You do not need tradeoffs for

each approach if there is an obvious implementation that meets the constraint; however, you must still state how you met a constraint, even if there are no tradeoffs, and justify your decisions to meet the constraint.

Most projects contain a microcontroller. You do not have to provide tradeoffs on the microcontroller choice if a generic microcontroller is sufficient; in this case choosing a microcontroller that you are familiar with (and saying that this is why you chose it) is fine. However, if you need a particular feature in the microcontroller (power consumption, some particular on-chip peripheral, etc), then detailed tradeoffs should be given.

Many projects are battery operated. You must include current draw equations that show that your battery choice meets your operating time specification. At the most basic level, this is simply the current draw of your system divided into the mA hour rating of the battery to get the number of hours that it will run. Most battery-operated projects, though, have a sleep mode and an active mode, and so your equations must show these two contributions. If your active mode has significantly different current draw depending on what the system is doing, then you must sub-divide your active mode into the percentage of time spent doing each task.

Software

For the software section, please review the lecture titled "Software Engineering" at this link: http://www.ece.msstate.edu/courses/ece4512/des1_syllabus/current/Software_Engineering.ppt

At a **minimum**, your software section must include the following:

- A few "sunny" and "rainy" day usage cases, along with a model data flow for a couple of representative cases
- A physical model diagram that shows how the user interacts with your system
- A flow chart that shows the basic top-level state machine for your software
- A discussion of the data types and data storage with which your software interacts

You do not have to present an object model or an object-oriented view of your design; however, you may do this if you are comfortable with this approach.

The approach document must present a **complete** picture of how your project meets all of the technical and practical constraints, as well as the operation of the hardware and software subsystems to provide the functionality needed for your project.

The link http://www.ece.msstate.edu/courses/ece4512/templates/doc/design.pdf provides more information about the approach.

Regarding the actual writing, my interests in your document are threefold:

1. Detailed, organized, and logical explanation of the approach components that Dr. Reese specifies

2. Coherence of sentences, paragraphs and sections, with logical transitions between ideas to provide flow to the overall document

3. Soundness of grammar and mechanics

See a few SD I documents from last semester to observe how the groups wrote their approach sections. Note, however, that guidelines and requirements may change from semester to semester, so if a sample document violates guidelines that Dr. Reese or I have given you this semester, then follow our guidelines instead of the sample document. As always, do not "borrow" passages or sentences from another group's document, since such "borrowing" constitutes plagiarism.

Third Major Deliverable – Evaluation

LENGTH REQUIREMENTS AND TARGET AUDIENCE: For the rough draft, each group must submit a minimum of six full, single-spaced pages (Times New Roman, 11-point, left-justified text that conforms to the template guidelines). For the final draft, the minimum length is eight full, single-spaced pages, and the maximum length is 15 pages. This document should not target lay readers but rather fellow ECE students (i.e., people whose knowledge levels are similar to your own). The evaluation document must be written in indicative mood (not imperative mood), as if you have already performed the tests on your system and are explaining the results of those tests. You may not have completed all of these tests by the first draft deadline, but include all of the information you can and fill in the rest for the final draft. Use of first person, if necessary, is allowed in this section.

4. Evaluation

Dr. Reese's information about the evaluation section's content appears below.

4.1 Test Specification

Describe in detail the tests you have run to verify your design constraints and the results of those tests. I expect four subsections for simulation, hardware subsystems, software subsystems, and system test. This document must be written in a narrative style as if you have performed the tests on your system, and you are giving the results of those the tests. In your first draft, you may not have all of this information, but you should by the final draft. Also, for any interfaces on your system—USB, I2C, SPI, RS232, parallel interfaces, or A/D inputs—you must show oscilloscope pictures that demonstrate a sample data transfer of this interface and the typical voltage/frequency ranges. Collect screen shots of your tests and include these in the final evaluation document. These oscope shots convince the reader that you have indeed tested the critical signals in your design.

The following are other general comments for your evaluation document:

a. Think about what a datasheet contains—tables, graphs, and circuits that show how the tables/graphs were obtained. If you make a test, show a circuit diagram of the test setup. You can show a photograph of the test setup in addition to the circuit diagram, but do not leave out the circuit diagram.
b. If you have a table of measured data and it makes sense to compare it against expected values, then include a *%error* as (actual – expected)/expected*100%, and use only three digits of precision. You need to have expected values unless you are making a measurement for exploratory purposes.
c. If you have a GUI of some type, you need a screen shot of it.
d. If you have a physical display of some type (LEDs, LCDs, etc.), you need a photograph of the display showing typical operation.

Sections in your document should include the following (when describing tests, explain the test and the test results in the same section – do not split test description and test results across different sections):

4.2 Test Certification – Simulation
Describes how you have used simulations to verify your design (may not be appropriate for all).

4.3 Test Certification – Hardware Subsystems
Describes how you have tested the various hardware subsystems of your design. For each subsystem, describe the test and the result in the same section.

4.4 Test Certification – Software Subsystems
Describes how you have tested the various software subsystems of your design.

4.5 Test Certification – System Test
Describes how you have tested the completed system with the hardware/software subsystems working together. Includes a table with test data that shows your technical design constraints and measurements that prove your system meets these specifications.

Adhere to these guidelines strictly, as Dr. Reese will grade the document primarily for content. Regarding the writing, I have three main concerns:

1. Detailed, organized, and logical explanation of the evaluation components: Test Certification—Simulation, Test Certification—Hardware Subsystems, Test Certification—Software Subsystems, Test Certification—System Test
2. Coherence of paragraphs and sections, with logical transitions between ideas
3. Soundness of grammar and style

For samples, see last semester's Senior Design I documents. I recommend reading a few evaluation sections closely to see how the authors followed these guidelines (or not) and how their strategies might benefit your document. Note, however, that if a sample document violates guidelines that Dr. Reese or I have given you this semester, then follow our guidelines instead of the sample. As always, do not "borrow" passages or sentences from another group's document, since such "borrowing" constitutes plagiarism.

Civil and Environmental Engineering Section Information

Paper Assignments

The three papers in this course are sections of one large research report, submitted at the end of the semester as paper 3.

Paper 1*:* For paper 1, write a 2-3-page document thoroughly covering the following points:

1. Describe which research topic you've chosen for this semester and why you chose it.
2. Describe the fundamental technical problem at the heart of your chosen topic.

3. Provide a list of references to be used on this topic (minimum of three – no websites).

To assist with no. 3 above, visit http://pubs.asce.org/research/ and http://library.msstate.edu/databaseportal/; at the latter site, see especially "Engineering Databases," "Dissertations and Theses," "Conference Papers Index," "Google Scholar," and "Web of Science."

***Paper 2**:* For paper 2, write a 2-3-page document thoroughly covering the following points:

1. Explain why research on your chosen topic is necessary: in other words, why is it significant that anyone conduct research on this topic?
2. Describe the probable findings, conclusions, and contributions of your research this semester. What are the specific technical findings on your particular topic? What conclusions can you draw about these findings, and what are the probable contributions of your research to the broader area of research on this topic?

***Paper 3**:* Paper 3 is your full research report, which must appear in one file (Word or PDF) organized into the following sections:

1. A submittal letter (new)
2. An executive summary (new)
3. A problem description (revised paper 1 minus why you chose your topic and the three references)
4. A discussion of the importance of your research (revised paper 2)
5. A description of existing or proposed solutions to the problem (new)
6. Your expected findings, conclusions, and contributions (revised paper 2)

Format
All papers must be formatted according to the CEE report format (http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/ceeformat.doc) and must use the APA style of documentation for citing sources (see 12.2 in *A Writer's Handbook for Engineers* for guidelines).

Presentations

NOTE: You will do both presentations in teams that we construct in class.

In-class review of PowerPoint slides: On these days, your team will show the rest of us your presentation slides, and we will give you feedback on what works well and what does not. These reviews will count as one of our in-class projects.

***Presentation 1**:* Presentation 1 must describe the fundamental technical problems at the heart of your chosen topic and explain why research on your topic is significant; the time limit is 8-10 minutes.

Post Presentation 1 DVD Assignment:

As part of your preparation for presentation 2, perform the following tasks with the DVD of presentation 1 you made in class:

3. Watch the entire DVD as a team (presentation + Q&A).
4. Write an e-mail to your instructor describing your reactions to what you saw on the DVD and how you anticipate your viewing of this DVD to help you work toward presentation 2 (and hopefully future presentations outside my class). This e-mail need not be an attachment or be formatted in a specific, formal way; specific written text will suffice.

***Presentation 2**:* Presentation 2 must cover your full semester research report (see the paper info page for full content details); the time limit is 12-18 minutes.

Your presentation must obviously be accompanied by appropriate PowerPoint slides and must use the APA style of documentation for citing sources (see 12.2 in *A Writer's Handbook for Engineers* for guidelines). We will discuss strategies for effective presentations at length in class.

Resources and Forms

- Effective Technical Presentations (http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/efftechpres.ppt) – This presentation discusses many of the basic components of an effective presentation.
- Dr. Miriam Smith's Slides on Delivering Successful Presentations (http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/smithslides.ppt) – Dr. Smith's superb presentation covers many of the same strategies as the one above but from a perspective more entrenched in technical CEE content.
- Sample student presentation (http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/brocato/SampleColPres.ppt) – This PowerPoint file is an excellent example of overall slide layout and design.
- Virginia Tech's Slide Templates (http://www.writing.eng.vt.edu/slides.html) – Although they do employ PowerPoint, Virginia Tech's templates for presentation slides challenge the standard bullet-point mindset of PowerPoint and can result in highly effective presentations.

- Garbage Dump in the Sky: Space Debris and Its Impact on Space Operations (http://gammaray.nsstc.nasa.gov/colloquia/abstracts_spring06/bcooke.html) – (The link shows the presentation abstract and contains a link to the slideshow itself). In addition to its complexity, attractiveness, and interesting-ness of topic, this slideshow contains many examples of effective and ineffective presentation elements (i.e., things you should do and things you definitely should NOT do).
- Edward Tufte's "PowerPoint Is Evil" (http://www.wired.com/wired/archive/11.09/ppt2.html) – The title says it all. While Tufte's opinions can seem excessively harsh, he does make timely points about common pitfalls of PPT.
- Presentation Review Form (http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/presreviewform.pdf) – This is the form your colleagues use to review your presentation.
- Presentation Grading Form (http://www.engr.msstate.edu/current_students/technical_communications_program/tcp/samplegradedpres.pdf) – This is the form I use to grade your presentation.