



Online Ethics Center
FOR ENGINEERING AND SCIENCE

Designing the 21st Century Engineer Assignments

Author(s)

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Description

A description of the assignments for the course "Designing the 21st Century Engineer".

Body

Assignment Overview

This course invokes the following eight assignments:

- **Set Your Own Goals:** identify personal learning objectives at the beginning, revisit them halfway through, and assess your progress at the end
- **Phase one homework:** a written homework, assess potential applications of the GVV ethical framework
- **Phase two homework:** a written homework, explore ethical/leadership challenges faced by engineers
- **Phase two project report:** the phase two project report, a two-four page document that you will research and write alone or in groups
- **Phase two project presentation:** present your phase two project to the class

- **Final project proposal:** the final project proposal explains your project goals and methods (submitted in draft form and then revised)
- **Final project deliverable:** produce at least one final project deliverable that showcases your accomplishments (can be a published paper, educational workshop, classroom materials...)
- **Final project presentation:** present your final project work to the class at the end of the semester. Let's go into some added detail regarding expectations and deadlines!

Set Your Own Goals Assignment

Due: 9:00 PM on Jan 26, Mar. 8, Apr. 26 (phases one, two, and three)

Format and Length: Goals are a few sentences each, and your final assessment is about a paragraph per goal (email all of this information to both instructors)

Collaboration: Do this one on your own

Our course offers you a lot of autonomy, and we want you to get as much as possible out of it. In addition to all the flexibility you have in choosing your projects, we also want you to identify goals that matter to you, and see those goals to fruition.

In previously-taught Olin courses, students have set goals such as...

- I want to improve my writing ability/ability to participate in class discussions/ability to design a poster.
- I want to create one high-quality deliverable that I can include in my personal portfolio.
- I want to learn about [insert topic] and determine if I want to major in this field in grad school.
- I want to identify a focus area within the Grand Challenge Scholars Program and begin some preliminary research in that area
- I want to use this course to figure out what interests me most at Olin, by the end of the semester I want to decide upon an AHS Concentration and/or finalize my choice of major.

- I want to learn about educational theory and figure out how to optimize my learning process.
- I want to work on my teaming skills, project planning, and management.

For this course you can think even bigger if you like – if you have career goals related to engineering education, or if you want to make a difference by creating materials that improve the way one or more Olin courses are taught, we can make that happen (especially in the final project!). How cool is that? (Please don't answer.)

The Set Your Own Goals assignment takes place in three phases.

Phase One: Goal Setting

On January 26, you will send an email to both instructors containing two to five goals that you would like to achieve this semester. Define each goal in about a sentence, and include a second sentence explaining why it is important. Finally, in a third sentence for each goal, suggest a few strategies you might use to achieve it.

Phase Two: Revisit Goals and Define Metrics

On March 28, you will send an email to both instructors that does two things:

- Make any changes you would like to your goals. Feel free to delete goals, modify them, add a new one, etc. Or leave them be.
- For each goal, identify an assessment metric—in other words, tell us how you will know whether you did a great job, an OK job, or a poor job. This only needs a few sentences.

Phase Three: Assess Results

On April 26 you will send a final email to both instructors that includes a self-assessment of your progress towards each goal. Follow the metric you created in phase two, and tell us how you think you did. Also, what can you do in the future to build on your progress or respond to what you learned? This should occupy about a paragraph per goal. Finally, use this opportunity to reflect briefly on the overall course in another paragraph or two.

Phase One Homework

Due: February 2 prior to the start of class

Format and Length: Word document emailed to both instructors, written response to questions, about a page total

Collaboration: Feel free to talk to others but think about it and write it up on your own

Your first homework assignment is short and simple. Prior to our February 2 class you will have read six chapters of *Giving Voice to Values* (GVV), as well as several examples of ways that it was applied to non- business applications and contexts. As we wrap up phase one of our course we will begin thinking about the main objective of our studies: how might we apply GVV to an engineering setting?

For this problem set please write brief responses to the following two prompts. Email them to both instructors prior to class and also have a copy with you so we can talk about them.

1. Identify elements of *Giving Voice to Values* that might apply to an engineering context – analytical frameworks, problem framings or strategies, case studies, general content, techniques, etc. A short list of relevant GVV aspects is one way to respond to this question (list the GVV elements and very briefly explain why each one is relevant), or you can use a concept map to illustrate the most relevant content or techniques and how they connect to engineering challenges.
2. What challenges will we face when we try to apply *Giving Voice to Values* to an engineering context? What will make this a difficult task? Also, which opportunities do you envision when we try to make GVV useful for engineers... what are some of the needs in the engineering curriculum, and how can GVV help to meet these needs? This response can be a short paragraph for the challenges and a short paragraph for the opportunities, or one large paragraph total.

Phase Two Homework

Due: February 9, before class

Format and Length: Word document emailed to both instructors, written response to questions, about a page total

Collaboration: Feel free to talk to others but think about it and write it up on your own

As with problem set one, this assignment should be emailed to both instructors before class, and you should have a copy with you in class so we can all have a discussion. You have two prompts:

1. Write up two examples of values-conflicts in engineering practice, drawn from your own experiences: one example will be of a time when you found a way to effectively act on your values and one will be of a time when you did not. These examples will ideally represent something that you witnessed or experienced, perhaps stories from your engineering internship, a job, a course, a club, or some other activity. If you cannot think of a personal conflict, try to interview someone about an experience that they had. In writing this up, please address the following prompts which are taken from the “tale of 2 stories” exercise: (About a long paragraph for each of your two stories)
 - a. What happened? What did others do, and what did you (or didn’t you) do?
 - b. If you took actions, what motivated you to speak up or act? If you did not take actions or speak up, why didn’t you? What would have motivated you to do so?
 - c. How satisfied are you? How would you like to have responded in an ideal setting?
 - d. What would have made it easier for you to speak/act (either things within your control, or things within other people’s control)?
2. Also, think about the application of ethics in an engineering education setting and answer the following prompts (1-3 sentences each):
 - a. What ethics/values/leadership skills or content do you think are the most valuable for engineers?
 - b. What challenges need to be overcome in delivering these skills or content?

- c. What questions do you have, and what resources might you use to answer your questions?

Phase Two Project Report

Due: February 23, by the start of class

Format and Length: A written report. About three pages or so.

Collaboration: Do this as a group. Seek any help that you like.

Project Two is an opportunity for us as a class to better understand the challenge that motivated this course in the first place! If all of us are going to take concrete steps towards modifying or developing a new engineering ethics/leadership framework and application strategy in project three, it might help to understand the “problem statement” first. How can we collectively understand the challenges and opportunities present in the application of ethics into an engineering education setting? Enter Project Two!

Following the early work begun in the Phase Two Homework, we will form teams to “divide and conquer” this open ended question. Each team will select one of the many values-driven challenges faced by engineers, and conduct some research to better understand it. In addition to explaining the nature of the challenge, each team will also propose an educational strategy that can help to address it.

The Project Two Report is a single document that your team will collectively research and write. It should be around three pages but this is just an estimate – we aren’t counting pages or marking off for being too long or short. Make sure that you address the following:

- Describe the nature of the ethics/leadership/values-driven challenge
 - Explain the problem.
 - Why is this a common problem? Who typically faces it, under which circumstances?
 - Offer a specific example—you need evidence here and it can come from an interview, online research, readings, etc.
 - Why is this significant? What are the implications?
 - What makes it a challenging scenario or problem? Do people in this situation typically find it difficult knowing how to act? Do they have trouble

deciding to act? Why?

- Propose an educational strategy that can address it
 - Can you draw from parts or all of GVV?
 - What other(non-GVV) information, frameworks, sources, etc. would provide helpful materials to address this problem?
 - What setting (a particular course, a certain stage of a student's education, a corporate exercise... specifics!) is best for the delivery of guidance on this problem? Why?
 - What educational content and pedagogical techniques are most promising? Why?

This report needs a combination of NARRATIVE and ANALYSIS. Make specific assertions, use detailed evidence (citations!!!), and organize your paper via clear topic sentences, transitions, and conclusions.

Phase Two Project Presentation

Due: February 23, in class

Format and Length: Assume that you have 10 minutes to speak, followed by a q/a session (we will confirm this when we see how many teams we have)

Collaboration: Do this as a group. Seek any help that you like.

We will use our February 23 class session to hear all of your research findings. Each team has 10 minutes to share some of your results with the class. This is not a lot of time, so your biggest challenge is selecting a subset of your materials and managing your time wisely – make sure that you make specific points and support assertions with evidence, but also make sure that you don't try to rush through too much content and reduce us to quivering slabs of Sodexo leftovers!

Presentation guidelines:

- Each group will have about 10 minutes... we may revise this when we see the lineup of groups and topics.
- Your audience is your fellow students, and your presentation will hopefully help them in the final project. Make sure you bring them up to speed properly: they don't know what you do. Educate them in an engaging manner.

- You are advised to use a PowerPoint presentation or visual materials, but this is not mandatory. Make sure the audience is able to follow your narrative and analysis (long oral presentations are usually hard to follow; interpretive dance usually demeans us all).

We will assess both the paper and the presentation according to the following criteria:

- **Communication and Organization:** did you write/speak clearly? No mechanical errors? Did you use visual or graphical materials effectively? Were you organized and directed?
- **Evidence and support:** did you offer quotes, examples, statistics, links, etc. to back up your analysis? Was your work detailed?
- **Analysis:** did you identify a relevant and accurate message to convey? Did you prove your points logically? Did you add insight to your audience's understanding of the issue?
- **Professionalism:** were you on time? Was this a thorough analysis? Was the presentation well- rehearsed and well received? Did you put forth your best effort?

Final Project Proposal

Due: March 1 (draft) and March 8 (final), prior to the start of class

Format and Length: each proposal is about 1-2 pages? (rough estimate)

Collaboration: Do the draft proposal on your own (unless you have a team in mind already, in which case you are welcome to work with them) and do the final proposal as a group. Seek any help that you like. Become one with all life on earth.

Our final project will occupy the majority of our semester, and gives you the opportunity to choose a topic, a set of activities to conduct, and a deliverable to produce. The first component of the final project is a proposal that maps out your trajectory. In effect, the proposal assignment is an opportunity for you to think through your final project experience and make plans that carry you from start to finish.

Final project mission

The mission of the final project is threefold:

1. Identify **ethics/leadership material** that is valuable to engineering students or practitioners. This material might include content (i.e., information), frameworks (i.e., ways of organizing and delivering information), activities (i.e., exercises that engineers can run through, and in so doing, become better educated), and many other possibilities. In addition to identifying these materials, you must make a case about why they are valuable. Why/how is there a current deficit in this area, and how will this material improve the situation? And if relevant, how can the GVV approach help to address the needs?
2. Identify a **delivery setting and audience** (for example, engineering employees at a company, the students in a specific class, all engineering students across the curriculum, engineering faculty in a faculty meeting or workshop...) and also a **delivery strategy** (i.e., a publication, lecture, workshop, moderated discussion...) that will address the opportunity listed in the prior prompt.
3. Produce “**deliverables**” that either explore the nuances of the challenge/opportunity identified in the above two prompts, or that begin to address them. The nature and length of these deliverables is up to you. Example deliverables include (but are not limited to):
 - a. A draft/outline/start to a research paper suitable for an engineering education scholarly publication. In this paper you can list some data relating to the current values-driven challenges faced by engineers, the lack of ethics/leadership in many curricula, how the GVV framework would help engineers, other approaches that would help, and ways of implementing these frameworks.
 - b. A presentation (possible audiences could include faculty members at an engineering school, or attendees of an engineering education conference) that covers some of the topics in point a above, i.e., explaining the need to teach ethics and leadership, the strength of the GVV and/or other specific frameworks or approaches, and suggestions of ways to incorporate this approach in existing curricula and classes.

- c. An interactive workshop, similar to option b above, but that actually helps faculty members integrate the ethical/leadership/values framework into an existing course.
- d. Some combination of a presentation/lecture/assignment/class activity/handout(s)/reading(s) that an engineering instructor could use in a classroom setting, to teach the ethical/values/leadership framework.
- e. Related to d above, a written GVV style case study and teaching note (examples available on the GVV curriculum websites) with suggestions about which courses it might be used in. In this example, you might consult with the Olin professor who actually teaches in the target course and engage their input/guidance/interest in piloting the materials (or inviting you to do so) in their course.
- f. Review the existing online interactive social cohort-based modules that introduce the GVV approach for business and develop a proposal for how they could be adapted for use in engineering education.
- g. Similar to option d above, but instead of merely designing these materials you can actually deliver them in a course this semester

Proposal guidelines

Wow, that final project sure sounds fine and dandy (who actually says “dandy” these days? Seriously, can any of you think of one time when this word was used in a normal conversation over the past year? If so, please email Rob and share your experience). But how do we get started? The answer is simple, young apprentice: you will write a proposal that outlines your plan of attack! This proposal will take place in two phases, each one vastly cooler than the other.

Draft Proposal Due on March 1

Phase one is a draft proposal due in class on March 1 (finish it before class and bring it with you). We assume that you will do this assignment on your own, and use our class session to find partners, but if you already know who you would like to work with, you are welcome to write this assignment as a group.

For this assignment, you should develop AT LEAST TWO ideas that you would be willing to work on. Note that you may end up modifying one of them, or abandoning both and joining another group, but it is still helpful to brainstorm

two ideas.

Each of your two proposals must include answers (a short paragraph each) to the following prompts:

- Which ethical or leadership content, frameworks, approaches, activities, and/or techniques do you think are most valuable for engineers? Make sure that you clearly explain the material that is useful, and briefly explain why it is valuable.
 - How will you research the materials that you just listed? In other words, what do you need to learn, and how will you learn it?
- What is the target audience and setting for these materials? Why this audience/setting?
- What delivery strategy do you believe is most effective in teaching the target audience about your materials? Why this strategy?
- If you end up pursuing this idea, what will you DO throughout the remaining weeks of this semester? This should include your research activities, your production and preparation tasks, and any outreach (education?) tasks that you consider a part of the process.
- If you end up pursuing this idea, what will you PRODUCE and DELIVER by the end of this semester? This should include written deliverables and also outreach activities.
- What are the biggest challenges?
- What impacts would you like to have?

Final Proposal Due on March 8

After presenting ideas in class on March 1, we will form teams and spend the next week refining our objectives and finalizing a plan of work for the remainder of the semester. Your final proposal (only one per team) should lay out this plan of work as follows:

- List your team members and team name (optional: include a team logo)
- State your mission in one paragraph. This mission should include your final version of the first two prompts in the draft proposal, i.e., what MATERIAL would you like to deliver, to what AUDIENCE, in what SETTING, and via what DELIVERY STRATEGY

- One paragraph justifying your mission statement: why are the above choices both significant and effective? What impacts will you have?
- Outline the RESOURCES that you will use. You need to locate at least three sources (they should be reputable) that will inform your work, and ideally more than three sources. You might also wish to list interviews or other resources that you will research throughout this activity.
- Offer a PLAN OF WORK that explains what each team member will do each week between now and the end of the semester. Go into as much detail as you are able – it will help us respond, and will help you when you move forward.
- Clearly list all DELIVERABLES that you will produce by the end of the semester. For each deliverable, explain as much as you can about its length, content, tone/style, etc. Note that you need to share deliverables with us, so if you deliver a talk (for example) you should film it. Basically, this is a place where you explain your expectations. The more you say here, the more feedback we can offer.
- Outline any CONCERNS and QUESTIONS that you perceive at the outset of this mission.
- Tell us: what could we do to make this more engaging for you? (Assume for the moment that we can cast magic spells.)

This proposal needs to work for you – use it to plan your own work, and to help us to help you!

Final Project Deliverable(s)

Due: April 26, in class

Format and Length: Impossible to answer! Depends on your project. Ask us.

Collaboration: Do this as a group. Seek any help that you like.

The open-ended nature of this project makes it difficult, if not impossible, to list guidelines for the final deliverable or deliverables. Hopefully we were able to offer you some valuable feedback and set realistic expectations after you submitted your final proposal.

By the last day of class (April 26) all deliverables are due. We cannot offer extensions! Make sure that you plan your time effectively and prioritize the key tasks early. We value quality far above quantity, and we value magic beans far above cows.

You need to find some way to share your deliverables with your noble instructors by the last day of class. Email us any files that you produced, and make recordings of any educational or outreach activities that you conducted. Contact us if we can help you capture your great work!

We will assess the final deliverable and presentation according to the following criteria:

- **Communication and Organization:** did you write/speak clearly? No mechanical errors? Did you use visual or graphical materials effectively? Were you organized and directed?
- **Evidence and support:** did you offer quotes, examples, statistics, links, etc. to back up your analysis? Was your work detailed?
- **Analysis:** did you identify a relevant and accurate message to convey? Did you prove your points logically? Did you add insight to your audience's understanding of the issue?
- **Professionalism:** were you on time? Was this a thorough analysis? Was the presentation well- rehearsed and well received? Did you put forth your best effort?
- **Feasibility and Shared Plan for Implementation/Communication:** did you offer a well- conceived, realistic strategy for the implementation of your ideas?

Final Project Presentation

Due: April 26, in class

Format and Length: Approximately 10 minutes to present, followed by q/a. We will revisit this time limit after we see which teams we form.

Collaboration: Do this as a group. Seek any help that you like.

Once we know how many teams we have for the final project we will allocate time for final presentations. These presentations will occupy nearly all of our final class time. They are your opportunity to educate the rest of us (what did you do? What did

you learn? What impacts did you have? What next steps might others pursue?) and to receive feedback on your progress.

The format of these presentations is entirely up to you. You are welcome to use PowerPoint but you don't have to. If you prepared and delivered a workshop or presentation as one of your deliverables, you can use some or all of your time delivering it for us. If you produced something written or tangible, you can hand it out and use it as a talking point. As long as you educate the class and give us an opportunity to provide feedback, you are all set!

Rights

Use of Materials on the OEC

Resource Type

Educational Activity Description

Topics

Workplace Ethics

Discipline(s)

Engineering