

19-101 Introduction to Engineering and Public Policy
Department of Engineering and Public Policy

Instructor: Dr. Deanna Matthews

Office Hours: Tuesday/Thursday immediately after class and Mondays, 3:00pm

Appointments: go.oncehub.com/DeannaMatthews and select Course Assistance

Where to find me:

Canvas email (preferred) or dh5x@andrew.cmu.edu

Porter Hall 126C or on Flagstaff Hill

Zoom ID: 284-524-0100

Course Objectives

By the end of the semester, students should be able to...

- Discuss basic concepts of public policy theory, the public policy-making process, and policy analysis approaches in relationship to issues of engineering and technology.
- Use engineering and social science techniques, skills, and tools to analyze engineering and technology, their impacts on our society, and resulting policy alternatives.
- Demonstrate that engineering analysis alone is not sufficient to solve a “real world” societal need or problem, and that technical and scientific information can support decision-makers in governments and institutions when devising or evaluating policy.

Evaluation (Briefly, more later)

I anticipate a standard grading curve, with 90%=A, 80%=B, etc.

Homework (includes reading, preparing for class, follow up work, reflections, etc) - 35%

In-class activities - 15%

Projects - 30%

Peer evaluations - 10%

Final - 10%

Course Description

This course examines interactions between technology and society, and the related processes of public and private decision-making. Classes involve a mix of lecture, discussion, and hands-on activities where students tackle interdisciplinary issues with both quantitative and qualitative methods. Students complete individual and group assignments that build skills in analysis and communication relevant for future careers. Past project topics include: using drone imaging to assess algal blooms in Lake Erie, incorporating renewable electricity generation on campus, reducing credit card fraud through data analytics, and creating standards for additive manufacturing of critical airplane parts.

Purpose and Broader Objectives

This course is designed for first-year students, partially as a means of introducing the Engineering and Public Policy or Science, Technology and Public Policy additional majors. But more so, the intention of the course is to introduce the connections between technology and society to

develop “more rounded” engineers and scientists. A previous EPP Projects course determined that CMU students who took even a single course with environmental content tended to have stronger pro-environmental attitudes. I am extending that relationship here: perhaps technical students who take just this single course with content specifically related to the impact engineering and science can have on society will have stronger awareness of the broader impacts of engineering and science in their careers. For non-technical students, the course will demonstrate why expertise from a wide array of fields is needed to address the complex problems of our society. No pre-requisite knowledge is required for the course other than that which you have by virtue of having been accepted to CMU.

Much of the topical content of the course will be outdated as soon as the class is over, given the rapid development of technology and societal norms. The focus is thus on interactions of technology and society, and developing problem-solving and communication skills, all useful as you progress through CMU and your careers. I listed the course objectives above, but **a main goal of this course is to make you an agile learner**, ready to tackle any problems in the future - both in your career and personal lives. This course, as with most college-level courses, provides you with a chance to learn and practice various skills desired by employers. These include:

- investigation skills, such as reading a variety of materials, thinking critically, asking questions and then developing answers
- teamwork skills, such as listening, working cooperatively and collaboratively, patience, and time management
- communication skills, such as writing and speaking for various audiences
- experience in marshaling resources, such as prioritizing, being prepared, having materials, seeking help, etc.

ABET Student Outcomes

ABET is the accreditation body for engineering programs. ABET and the EPP program have a special set of “outcomes” that all engineers should have achieved by the time they graduate. This class aims to get you started on achieving some of those, to some extent, including:

1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics
2. an ability to apply engineering design to produce solutions that meet specified needs with consideration of public health, safety, and welfare, as well as global, cultural, social, environmental, and economic factors
3. an ability to communicate effectively with a range of audiences
4. an ability to recognize ethical and professional responsibilities in engineering situations and make informed judgments, which must consider the impact of engineering solutions in global, economic, environmental, and societal contexts
5. an ability to function effectively on a team whose members together provide leadership, create a collaborative and inclusive environment, establish goals, plan tasks, and meet objectives
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies.

Structure of the Course

The flow of the course will involve a set of pre-assignments to be completed at the start of a section, including reading the text or other materials, preparing responses to those readings, attempting example problems, etc. so that you are prepared for class discussion and work. Tuesday and Thursday class periods will involve a combination of instructional strategies, including lecturing (by myself and others), group activities and discussions. Since we learn by doing, during class you can expect to participate in some hands-on/active learning task, individually and in small groups. Friday recitations will involve review of the week's concepts, additional problem solving, Q&A, and group work time. At the end of a section, you will have a second set of assignments to summarize your learning.

This is a 12 unit course, so I anticipate that you will have, on average, 12 hours of work per week for the class. With 3 hours of regular class and 1 hour of recitation, that leaves 8 hours of work for you to do outside of class. This would include:

- 2-3 hours reading the text, topical articles, or current news and responding to them
- 3-4 hours completing homework assignments, or working on projects
- 1 hour discussing/arguing with a classmate on course content

You should plan accordingly. You should reserve some time between 1:00pm on Tuesdays and 11:40pm on Thursday to do some work for this class. **A significant amount of the learning is done individually outside of class, so make of it what you will.**

I do not think any particular topic in this course is hard conceptually, but that does not mean you do not have hard work to do. Unlike other introductory engineering courses, problems in this domain often don't have one "right" answer. That alone often makes this course difficult for some students.

Required Materials

Textbook: Charles Wheelan, Introduction to Public Policy. W. W. Norton and Company, Inc. New York, 2011. Either the hardback or paperback version is fine. This will be a good resource for students who are planning on pursuing the EPP/STPP additional major. A copy of the textbook is on reserve at the Sorrels Library.

Textbook excerpts: Ed Rubin, Introduction to Engineering and the Environment. McGraw-Hill, 2000. Don't let the title sway you - two chapters are basic tools for analysis. Electronic versions of the required chapters will be provided.

Book excerpts: Eugene Bardach, A Practical Guide for Policy Analysis. CQ Press, 2000 (First edition). More recent editions available. A link to the first edition is available via CMU library.

Materials: Calculator with power function (x^y), exponential function (e^x) and logarithmic function [$\ln(x)$] that is not also a phone/internet device.

Course Communication and Resources

Students in my courses are a priority of my work, so do not hesitate to contact me regarding any course issues. However, I need your help to assure that I am able to respond to you quickly. All materials will be available via Canvas and/or hardcopies available in my office.

- ~~Piazza: The vast majority of course communications should take place here. Students have the option of posting questions about all aspects of the course, and posts can be made privately and/or anonymously. Students can take an active role in helping to answer questions, too. The TAs and I will be monitoring Piazza regularly so responses during the day should be quick. Students should check here regularly for updates and announcements and should look here for answers to FAQs first.~~
- Canvas: You should have access to the course Canvas site. You should be able to find all course materials there including materials presented in lecture, handouts, additional reading materials, projects, homework assignments, and supplemental guides.
- CATME: The Comprehensive Assessment of Team Member Effectiveness is a tool to help manage student teams in group work. The system does surveys to help create teams and allows peer evaluations of teams. You will receive email directly from the CATME system with personal links to complete tasks on the system.
- Office Hours: ~~The TA(s) and myself will establish office hours and post the times and locations on Canvas. Office hours should be a first point of contact for course issues.~~
- Office visits: My office is Porter Hall 126C. ~~You do not need to knock on the outer door, and Debbie in the outer office will be happy to offer you seasonal candy. If you have an appointment or it is office hours, you can come on in to my office. If not, I will meet with you if I have time, otherwise Debbie or I will help you book an appointment for later. The TA(s) will let you know a location for office hours separately.~~
- Appointments: go.oncehub.com/DeannaMatthews If you need to meet with me separately from class or regular office hours, please use my scheduling tool to make an appointment. Please include a short informative note about why you are coming. ~~Communicate with the TA(s) via email or at recitation to make an individual appointment with them.~~
- Email: Use the Canvas email or dh5x@andrew.cmu.edu **Please use Piazza first to communicate with me. You can make messages private to myself and/or TAs on Piazza.** When sending an email to me, please include 19-101 (with hyphen) in the subject line so that it will get filtered and (hopefully!) answered more quickly. Please also include an informative subject. For example, Subject: 19-101 need extension on HW1 due to ER visit, will get my attention much faster than Subject: quick question. ~~Unless it is an issue with your TA or a private matter, I strongly urge you send the message to the TA as well. I attempt a 24-hour response time, but I rarely check email on weekends. Again, the majority of issues should be posted on Piazza, using private setting.~~

More on Evaluation and Grading

By the end of the semester, students will earn a grade. I would love to have everyone earn A's, but you have to demonstrate that you meet the course objectives above, and do quality work.

Homework (includes reading, preparing for class, follow up work, reflections, etc) - 35%
In-class activities - 15%

Projects - 30%
Peer evaluations - 10%
Final - 10%

Above is the default breakdown for weighting graded components of the course. You will be able to change the default breakdown as a homework question later in the course. You may also complete optional activities to further change the weights, which is in lieu of any extra credit options.

I calculate your final numerical score within each category based on the total points you earn in that category divided by the maximum points available in that category. I do not use the average of your percentage scores. Please review the grading spreadsheet available on Canvas to assist you in determining your final grade for the course and more will be discussed in class.

Some of the work you will do will be done individually, some will be done with others both in and out of class. Please see the section on Collaboration later for more details on assuring you are meeting Academic Integrity expectations. For any group work, I reserve the right to give a group member zero or negative points on an assignment where they did not contribute to the final work product or made life miserable for other group members.

- **Homework** includes reading, completing reading responses and pre-class questions or problems, completing post-class questions or problems, peer reviewing work, and completing peer evaluations. Pre- and post-class questions will include a combination of quantitative and qualitative responses. Some post-class work will involve summarizing the previous content and applying it to new areas. Reflections will also be part of homework. This is time for you to stop and think about your progress in the course. Most of you are first year students, still adjusting, and to some degree “learning how you learn.” Taking time to reflect on what we have done during lecture and recitation, putting into words what confused you or excited you, is part of the learning process.
- **In-Class Activities** will include completing short-answer questions, sharing homework results, doing example problems, and discussing in small groups all done during class and recitation. You cannot make up missed in-class activities, but missing two will not have an adverse effect on your grade.
- **Projects** are group assignments that reflect a current technology-society issue and will involve a combination of background research, problem structuring and solving, and communication of results via a professional written document and presentations.
- **Peer Evaluations** will follow each Project submission and some In-Class Activities. Credit for completing the Peer Evaluations is included in homework, but credit for results of the Peer Evaluations are included in your group assessment. In the real world, you will be asked to evaluate your work colleagues (and yourself), and that information will be used to determine raises and promotions, and this mimics that future task.
- The **Final Event** will be scheduled during the University final exam period. ~~Do not make travel arrangements to leave Pittsburgh prior to the final exam schedule being posted.~~

Optional activities

Note these are NOT extra credit assignments. These are entirely optional, but lend themselves to learning about technology and society, and as such are worthy pursuits. You may complete any one, or all of them. These activities are estimated to take ~1.5 hours each. More details and requirements

for each activity are on Canvas. One activity can be used to weight 2% of your final grade, reducing the weight for the required assessments. More details about the activities and the submissions in on Canvas.

Quality of Work (Adapted from John Kitchin, Chemical Engineering professor)

Is getting an A on the final exam sufficient for getting an A in the course? No. Life is about consistency and reliability, too, and demonstrating abilities on a range of assignments. So, while your work will be given a numerical grade, we also inherently judge the quality of the work in assigning grades. If anything were to make me bump a student on the borderline up a grade level, it would be whether or not they consistently and reliably submit quality work.

"A" work has the following characteristics: The correct approach is used and the problem is set up correctly. The work is not over-simplified and it is easy to see it is done correctly. Any assumptions made were stated and justified. The answers are correct or only the most trivial errors are present, and were identified by the student. All of the correct units were used. Numerical results are given with reasonable significant figures representative of the uncertainty of the problem. Written responses are pertinent to the topic, concise, and well-reasoned. The presentation is complete, clear, logical, neat and in order. Any figures used have properly labeled axes with units, and a legend if there is more than one curve. The work is professional in appearance, and submitted on or before the deadline. Essentially everything that should have been done was done and was done correctly. This is the kind of work an employer wants their employees to do, and the kind of work you will be promoted for doing. You should be proud of this work.

"B" work is deficient in one or more of the properties of "A" work. It might be basically right, or even correct, but essential details are missing such as units, or the presentation is sloppy. You will get by with this kind of work, but you should not expect to be praised for it.

"C" quality work is deficient in more than two of the properties of "A" work. You would probably not get fired for this kind of work, but you may be notified you need to improve and you should not expect any kind of promotion. This is the bare minimum of expected performance.

"D" work is not considered acceptable performance. Repeat offenses could lead to the loss of your job, or reassignment to radioactive sewage treatment.

"R" work is totally unacceptable performance. You will be fired. Maybe indicted, and put in jail for endangering humanity.

Submission of Work, Due Dates, Missed/Late Assignments, Extensions

Please follow directions for submitting work. In most cases, you will need to upload to Canvas or complete an online survey. You can take a photo or scan of written work to upload if needed.

Due dates are given for all work, but I'm somewhat flexible on late submissions. Any work will be graded without direct penalty (meaning, work will be graded out of the full points possible), but I note what is submitted late and will take that into account when assigning mid-semester and final grades. Each student will receive two (2) No Questions Asked passes allowing an assignment to be submitted late with, guess what - no questions asked. I am sensitive to demands in other courses, with students often having tests and homework due at the same times, so extensions are happily granted. If you are habitually late, we will discuss. Typically, no submissions can be accepted more than 4 days late or after solutions are posted, whichever is earliest.

Project work is the exception - you can't get your group off schedule. Prioritize any assignments to be completed with a group over individual assignments, but please come discuss if you are struggling with completing work on time.

Grading Discrepancies, Requests for Regrades

If you have questions about a grade received or a score for a particular problem, you must wait 24 hours after the assignment is returned before inquiring about it. In other words, do not come up immediately after class to find out why you got points off for your answer to a particular question. During the 24-hour waiting period, recheck your work, review the materials from class, contemplate your answer. Then, come to discuss the score with either the TA or myself or to get the math checked. Please consider the potential grade change when asking for a regrade. If you are gaining fewer than 10 points it is probably not worth the time versus doing work on the next assignment. **I/TAs will note on homework or tests whether you should come to discuss your work based on a very poor grade. Do NOT ignore these messages.**

Collaboration versus Unauthorized Assistance, Cheating, and Plagiarism

Collaboration is encouraged in the course for discussing topics outside class and in completing quantitative problems or group assignments. Collaboration in the latter sense means working together to frame problems, devise approaches, and comparing (not copying!) results. (As an undergraduate, this was invaluable for me – as minor errors using a calculator could be caught.) It can also mean using course resources such as TAs, Academic Development, or the Global Communication Center. Any work submitted for a grade, however, should be of your own creation. Each of you has your unique approach to setting up a problem or writing that should be evident in your work that differentiates it from another student's work. One strategy to avoid any suspicion of unauthorized assistance is to leave a collaboration session with a rough draft and notes, and to write up your final submission separately and after a short break. **Collaboration and assistance should be indicated by adding a simple note to the submitted work listing the names of anyone or any resource you work with on your assignment.**

Unauthorized assistance includes using sources of support (people, books, websites, etc) that have not been specifically permitted, including work of students who have taken this course previously and submission of work previously completed for a grade/credit in another course. Cheating is copying someone else's work and turning it in as your own work. Plagiarism is copying someone's published material and submitting it as your own work. **All three - unauthorized assistance, cheating, and plagiarism - are unacceptable and will be dealt with according to university policies.** Usually, this will mean a zero grade on the assignment in question, no ability to drop that grade from final grade calculation, and reporting of the incident to the appropriate department head or associate dean and to Student Affairs. In addition, you may not drop or withdraw from the course to avoid the resulting poor final grade from an incident.

If you ever have any doubt about whether work you are submitting is completed appropriately, please ask prior to completing the work and prior to submitting. Keep in mind that I am an experienced instructor – I can identify when work is identical versus when work is your own, or when writing is that of others more knowledgeable in the field. My aim is to foster an environment where you can learn (and learn to collaborate and use resources correctly), while ensuring that the work we all do is honest and fair.

Class and Course Material Dissemination

No materials from the course, whether printed or available on the Canvas course site is to be shared electronically or posted on any other website without express written permission of the instructor.

This includes homework problems and solutions, lecture slides, and project statements. No recording of classroom activities is permitted without prior permission.

Attendance and Participation and Succeeding in Class

Special note for Fall 2020 - I swear I've had this in my syllabus for years...

Of course you should come to class - unless you are ill and contagious, or have a valid excuse. I promise time spent in class will be better than watching paint dry. Please do your best to arrive on time and stay for the entire class. Class time is an opportunity to practice what it is we are learning. You can try and fail in class, and do so without penalty. You can ask questions. I do not just use slides and lecture, but an assortment of activities during lecture period. Most class periods will have a review or discussion of key points, and some sort of learning activity. Most often the learning activity is completed in a group (or multiple groups). So, to make up missed class time is not simply a matter of getting notes from someone, but getting someone to explain the process, the range of outcomes from the groups, and the summary of the discussion. Plus, you cannot make up in-class work. Past experience in my courses suggests that students who are frequently absent from class do poorly in the course.

To avoid getting ill, wash your hands frequently and well. If you have a garden variety cold, stay in bed, drink copious fluids, and rest for 24 hours. Contact any group members as appropriate. If you have another valid excuse, such as a job interview, court date, or other urgent matter, contact your TA (not me) if you will be missing recitation. We don't need to know if you will be missing a single lecture.

If you are gravely ill, such that you will miss 3 or more sequential lectures or on an on-going basis, please email me and your TA, provide a doctor's note, and we will discuss once you are well how to deal with missed work. If you have another urgent matter where you will miss 3 or more sequential lectures or which is going to severely impact your attention to the course, please email me and your TA, as well as your Housefellow or academic advisor.

~~Athletes who will be traveling for competitions should identify themselves early in the course, and notify your TA ASAP of recitation dates you will miss.~~

IF YOU MISS CLASS, you are responsible for what you miss. Emails to me asking what you missed will be deleted without a response. Materials from class should be posted to Canvas, and can be discussed with a friend. Talk to the TAs for additional clarification, but they too reserve the right to ignore requests to reiterate an entire class session.

*Take care of yourself. Do your best to maintain a healthy lifestyle this semester by eating well, exercising, avoiding drugs and alcohol, getting enough sleep and taking some time to relax. This will help you achieve your goals and cope with stress. All of us benefit from support during times of struggle. You are not alone. There are many helpful resources available on campus and an important part of the college experience is learning how to ask for help. Asking for support sooner rather than later is often helpful. **If you or anyone you know experiences any academic stress, difficult life events, or feelings like anxiety or depression, we strongly encourage you to seek support.** Counseling and Psychological Services (CaPS) is here to help: call 412-268-2922 and visit their website at <http://www.cmu.edu/counseling/>. Consider reaching out to a friend, faculty or family member you trust for help getting connected to the support that can help. I am happy to be that person.*

Accommodations

If you have learning needs that require adaptations, please contact me within the first week of class, or within one week of the documentation if later in the semester. I am happy to arrange accommodations based on the recommendations. Likewise, if you have another personal issue that you think is important that I am aware of, make an appointment to discuss it with me.

Use of Phones During Class and Recitation

ALL PHONES SHOULD BE PLACED IN “DO NOT DISTURB MODE” AND PUT AWAY DURING CLASS. If you are expecting an emergency call, please let me know at the beginning of class and accommodations will be made. Class time should be treated as a professional meeting period, and as such taking calls, checking and sending messages, having phones beep and buzz with notifications, etc. is rude and unacceptable. Would you want me to be stopping class to send a text?

Use of Laptops/Tablets During Class and Recitation

Laptops and tablets may be used during some classes as part of the class activity. You are not required to bring one, as those activities will be done in groups with a person with a device in each group. Use of laptops and tablets otherwise is To Be Determined during the first week of class.

Research on Teaching Strategies and Student Learning

For this course, I am conducting research on the impacts of teaching strategies on student learning. This research will involve analyzing student coursework. You will not be asked to do anything above and beyond the normal learning activities and assignments that are part of this course. You are free not to participate in this research, and your participation will have no influence on your grade for this course or your academic career at CMU. If you choose not to participate in the research, you must still complete all required coursework, but your data will not be included in the research analyses. Participants will not receive any compensation. The data collected as part of this research will include student grades. All analyses of data from participants' coursework will be conducted after the course is over and final grades are submitted. The Eberly Center may provide support on this research project regarding data analysis and interpretation. To minimize the risk of breach of confidentiality, the Eberly Center will never have access to data from this course containing your personal identifiers. All data will be analyzed in de-identified form and presented in the aggregate, without any personal identifiers. Please contact Dr. Chad Hershock (hershock@cmu.edu) or me at dh5x@andrew.cmu.edu if you have questions or concerns about your participation.

General Expectations

I expect students to be as engaged in the course as I am. I know that won't always happen. Some of you are here because you need a 2nd intro/didn't want the other intros/have to take a technical course/your friend convinced you. That's fine. But, that doesn't mean I don't expect you to be prepared for class.

I expect students to have the highest degree of academic integrity. I expect you make your [insert person you want to be proud of you] pleased with how you handled temptations to go beyond collaboration, to cheat, to plagiarize. Please don't disappoint me, too.

I expect students to be able to use MS Office/Mac iOS apps, to do high school level math, and to write grammatically correct sentences. By virtue of having been accepted to CMU, you all have the requisite skills needed. Please ask for help whenever you need it.

I expect students when in class to be attentive to this class. This means not doing work for another class, and not being off-task on laptops (if their use is allowed). In-class activities are designed for every person to participate and be accountable for that participation.

I expect to change the schedule and topics. I don't know you yet to know what will make this class work. We all need to be flexible.

I expect to tell some crazy stories, refer to movies that you haven't seen, and show my age. I hope you will humor me and laugh along with me.

Students can expect that I and the TAs will come prepared to class. If we don't, we aren't doing our job. Students can expect assistance in clarifying course topics and completing assignments during and outside class time.

Students can expect prompt feedback on their progress either through graded materials or communication from the instructor and TAs. Please keep in mind there are many of you, and one of me/3 of us. "Prompt" and "immediate" are not synonymous.

Students can expect to have a class different from other technical classes, to have to talk to other people in the class, to answer questions in class, and hopefully enjoy learning about the topics of the course.

Finally, I expect an atmosphere of mutual respect among all class participants - myself, TAs, and students. In the context of the class, we all come into the course with various viewpoints, assumptions, beliefs, ideas, and questions. None of these are necessarily wrong, but may be different from your viewpoint, assumption, etc. and this diversity of experience is a resource, strength and benefit of the course. It is my intent to present materials that are respectful of this diversity, and your suggestions are encouraged and appreciated. As you will soon learn, there is no one "right answer" to the situations we will investigate, so each opinion is valid and deserves consideration.

Outside the context of class, we all have responsibilities and commitments elsewhere in our lives. Yours involves other courses, jobs, and activities; mine involves advising, other courses, administrative work, research, and a family. I am generally an understanding person when these outside forces interfere with course work for you; I hope you offer me the same.