THE OHIO STATE UNIVERSITY
JOHN GLENN COLLEGE OF PUBLIC AFFAIRS

THE OHIO STATE UNIVERSITY
COLLEGE OF ENGINEERING

PUBAFRS 5600 / ENVENG 5600: Science, Engineering, and Public Policy
Tuesday/Thursday, 3:55-5:15, Page Hall 060
Spring 2018

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Teaching Assistant:
None this year. Bummer.

Description:
Science and engineering underpin innovation, national security, and many other areas of public concern, including those related to Ohio State University's Discovery Themes: (1) Energy and Environment, (2) Food Production and Security, and (3) Health and Wellness. But the contexts regarding (a) investments in science, engineering, and public policy and (b) the causes and consequences of the development of scientific knowledge and engineering innovations tend to be underappreciated by those involved. For example, on one hand, funding decisions are made by policymakers—many of whom lack technical training and an appreciation of the role of government in these arenas—and, on the other hand, scientists and engineers often develop knowledge and innovations as a result of, and have relevance to, public policy. Scientists and engineers can be empowered by understanding the process of investment, support for research, and the broader influence of their work. Similarly, policy-makers can benefit from understanding how science and engineering unfolds and how to use scientific and technical information for decision-making on matters of national and international importance. This course is designed to serve both perspectives—those making policy for science and engineering and those using science and engineering to inform policy—with a survey of policy, processes, and contexts for science, engineering, and innovation in the United States.

The class will present an overview of (a) the history of the interactions between science, engineering, and public policy in the United States and in the context of global concerns (e.g. climate change, competitiveness); (b) how various the federal government, universities, and corporations conduct and fund science and engineering; (c) how public sector interests and processes influence, and are influenced by, science, engineering, and public policy; and (d) policy analytic approaches for science and engineering. Case studies devoted to the science, engineering, and policy of the University's Discovery Themes will help students apply policy analysis and developments in science and engineering to understand the relevance to real-world needs and policies.

Class discussion is an essentioal component of this course and is a In the past we have had a guest lectures from a variety of people, including Prof. Bharat Bhushan (a former ASME Congressional Fellow), Mark Reichanadter (former Chief Operating Officer of Stanford Linear Acelerator Center National Accelerator Laboratory), David Williams (Dean of the College of Engineering) and individuals from Virgin Galactica, the Ohio Department of Transportation, and elsewhere.

Learning Objectives and Student Outcomes:

Through this course, you will:

1. Examine the processes and contexts related to science, engineering, and innovation and understand how they reflect values, goals, and interests.
2. Synthesize strategies for policy analysis and evaluate a real-world topic related to science and engineering using these strategies.
3. Develop the capability to identify the relevance of advances in scientific knowledge and engineering developments to broader public policy issues.
4. Analyze cases that involve the interactions between science, engineering, policy, public choice, risk, and consequences in fields related to Ohio State University's Discovery Themes and other current issues.

Learning Objectives and Student Outcomes:
This course prepares engineering students to attain the following Accreditation Board of Engineering and Technology (ABET) educational objectives. The ABET student learning outcomes will officially change for the 2019-2020 academic year. The following table maps the new outcomes to the old outcomes, and the light grey text indicates the outcomes that are not covered in this course:

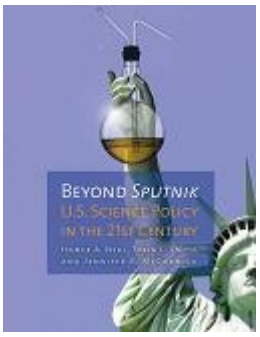
New Student Learning Outcomes	Old Student Learning Outcomes
1. an ability to identify, formulate, and solve complex engineering problems by applying principles of engineering, science, and mathematics	(a) An ability to apply science and engineering knowledge (e) Identify, formulate, and solve engineering problems
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.	(c) An ability to operate within realistic constraints such as economic, environmental, social, political, ethical, and sustainability
3. an ability to communicate effectively with a range of audiences	(g) an ability to communicate effectively
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	(f) an understanding of professional and ethical responsibility (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context (j) a knowledge of contemporary issues
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	(d) an ability to function in multidisciplinary teams
6. an ability to develop and conduct appropriate experimentation, analyze and interpret data, and use engineering judgment to draw conclusions	(b) an ability to design and conduct experiments, as well as to analyze and interpret data
7. an ability to acquire and apply new knowledge as needed, using appropriate learning strategies	(i) A recognition of the need for, and ability to engage in, lifelong learning
Implied in 1, 2, and 6.	(k) an ability to use the techniques, skills, and modern engineering tools necessary for engineering practice

This course may be counted as a technical elective in Civil, Environmental, and Geodetic Engineering, and in Mechanical Engineering, and is one of the select core courses in the Environmental Science Graduate

Program. The course also fulfills the Global Option in the College of Engineering and is one of the core courses in the undergraduate minor in Science, Engineering, and Public Policy.

Classroom Participation and Conduct:
Advance reading and active participation are critical elements of success in this course (and in life). Lively and active classroom discussions are effective learning mechanisms for you and your peers (and thus incorporated into your class participation grade), so be prepared to contribute to the discussion during class. You are expected to engage in the learning environment that will be created within the classroom, and it is important for each student to engage deeply and critically with the material. Consequently, laptop computers, tablets, and other devices will not be allowed unless specifically stated that they may be used to look up some information related to class, or you use them to take notes. If you choose to use such a device to take notes, the wireless capabilities must be turned off (otherwise known as "Airplane Mode"). Similarly, mobile phones must be turned off, unless you are awaiting an important phone call (e.g., your pregnant wife may be close to labor, the Chicago Cubs are about to win the World Series, again).[1] If you are expecting such a phone call, please tell me before the start of class to get permission to leave your phone on (in vibrate mode, please). Courtesy and respect for your colleagues during class discussions will be enforced. Out of respect for my schedule and yours, class sessions will begin and end on time.

Course Requirements:
Textbook and Readings:
There is one required textbook, and other required and optional readings will be posted to the Canvas website for this course. The required textbook (below) is available through the OSU library system for free:



Homer Neal, Tobin Smith, and Jennifer McCormick. Beyond Sputnik: U.S. Science Policy in the Twenty-First Century. (Ann Arbor: University of Michigan Press, 2008) ISBN 0472033069 http://www.science-policy.net/

You can download the book by chapter by logging into the OSU library system (library.osu.edu), searching for "Beyond Sputnik", choosing the option that lists the text as an eBook, clicking on "Find It @OSU" under "Find a copy online". That will take you to Project Muse, where all of the content is available for you to download.

But wait… I have already done it for you—to save your precious time and energy for engaging in enlightening class discussions. I will post the relevant chapters to Canvas:

You are expected to read all of the readings prior to class. Many readings will be timely due to recent events and the goal is to address the most recent developments as possible. As such, a number of readings will be posted to the Canvas course website only a couple days in advance of the class session. You will be assessed on your ability to demonstrate knowledge of the material through your in-class contributions and other assignments. You are welcome to draw from material in other classes to support course work. You are also encouraged to read broadly (e.g. New York Times, Scientific American, brainpickings.org), to watch The West Wing (on Netflix), and to bring relevant issues from current activities in public affairs to class to enhance our discussion.

Assignments:
In addition to actively participating in the course during class and in the online discussion board, you will also be assessed on class notes, a midterm exam, two short papers, and a class presentation based on one of those papers.

[1] Please don't test me... I have worked for numerous national laboratories within the United States and still retain some privileges. In other words, I have certain resources at my disposal that are not available to the public… ☺

Grading and Assignment Detail

Class Participation (every session, first half, 01/08-02/21):	5%
Class Participation (every session, second half, 02/26-04/18):	5%
Class Notes (due as described in course calendar):	10%
Short Midterm (due March 7th):	20%
Short Paper #1: Policy Analysis Frameworks (due 2/18):	20%
Short Paper #2: Policy Analysis Application (due 4/15):	25%
Presentation on Policy Analysis	15%
(undergraduate students, 2/19 or 2/21; graduate students, 4/16 or 4/18)	

Class Participation

There are few things more important to success in engineering, in public affairs, and in life than effective communication and the ability to conduct yourself in a way that ensures your message is clear. This class mixes lectures, case studies, teamwork, and discussions; it is a laboratory for you to refine your communication skills. You are expected to be prepared, to thoroughly process and synthesize information, and to incorporate your thoughts and experiences. In other words, you will need to be reading and thinking as we proceed through the semester. As a result, regular attendance and active participation are necessary. Read assignments for class, and be prepared for class discussion. I understand that everyone learns and participates in different ways, some of which may require more reflection than can occur during a class session. If this is the case, you have the opportunity take advantage of the Canvas discussion board.

Attendance necessary. If you need to miss class, please email me before that lecture. Absences without prior notification will be considered when determining your grade for class participation. There will be a number of guest lecturers throughout the semester, and full attendance is expected.

Your class participation will be assessed in two parts: You will receive a grade for your participation in the first half of the semester, up to February 21st, and another grade for your participation in the second half of the course, February 26th through April 18th.

These assessments will each account for 5% of your final grade. A rubric will be made available for evaluating your class participation and so that you can be a meaningful contributor to the class.

Class Notes:

You are required to take your own notes for each class session throughout the semester. At the beginning of the course, you will be assigned to a group and sessions for which you and the others in your group will compile your notes into one unified and cohesive set for that class session. There will be one group taking notes each session, and each group will take notes twice during the semester. These notes are **due at 5:00 pm three days after the class session by email to me as a Microsoft Word document**. I will review them and post them as a pdf to the course page on Canvas. As a result, these notes will serve as resources for all students in the class. Each group notes will be graded on how thorough, correct, and well-presented they are. The notes should be about the topics that are discussed in class, and I encourage you to not limit your notes to just what was presented; also incorporate details from the readings and elsewhere.

Each of these group notes is worth 5% of your total grade. A grading rubric will be provided to help you prepare quality notes.

Short Mid-Term Exam:

There will be one short mid-term exam that will be based on the readings, lectures, and discussions. The midterm accounts for 20% of your final grade and will cover material up to the exam date. The mid-term will be a take-home assignment that is distributed on February 21st and is due on March 7th.

A grading rubric will be provided to help you prepare an excellent midterm.

Short Papers and Presentations:
Understanding and applying policy analysis to scientific and engineering issues is one major aspect of this course. These assignments will develop those capacities. You will write two short papers and give one in-class presentation during the semester. These papers and presentations will differ depending on whether or not you are an undergraduate student or a graduate student.

- A grading rubric will be provided to help you prepare a quality paper.
- A grading rubric will be provided to help you design and give an interesting, quality, informative, and engaging presentation.

Short Paper #1:
The assignment will be distributed at the end of class on January 24th and is due by uploading to course website by 11:59 pm on February 18th. The assignment will have a list of approaches to policy analysis, where

- Undergraduate students will work in assigned groups to produce a three-page paper on one approach to policy analysis. *These groups will present the approach to policy analysis that they investigated on February 19th or 21st.* These presentations will be assessed by me and the graduate students in the class. These assessments will be compiled and returned to the undergraduate groups.
- Graduate students will work independently to produce a five-page paper on all of the approaches to policy analysis on the list.

Short Paper #2:
The assignment will be distributed at the end of class on March 19th and is due by uploading to the course website by 11:59 pm on April 15th.

- Undergraduate students will work in assigned groups to produce a three-page paper that applies one of the approaches to policy analysis to a topic that is listed in the assignment.
- Graduate students will work independently to produce a seven-page paper that applies one of the approaches to policy analysis to a topic related to their research. If a student is not conducting research for his or her graduate degree, he or she will apply one of the approaches to policy analysis to one of the topics on the list. *Each graduate student will present his or her analysis on April 16th or 18th.* These presentations will be assessed by me and the undergraduate students in the class. These assessments will be compiled and returned to the graduate students.

Deadlines:
Short Paper #1, Short Paper #2, and the Short Mid-term Exam must be uploaded to the course website by 11:59 pm of the day that they are due. The maximum number of points you can earn on the each of these assignments will be reduced by each day that they are late, according to the following schedule (Note that a day begins at 12:00 am):

- One day late (12:00 am on the day after it is due to 11:59pm the following day): 50% reduction.
- Two days late (12:00 am two days after it is due to 11:59pm the following day): 75% reduction.
- Three days late (12:00 am three days after it is due to 11:59pm the following day): 90% reduction.
- Four days late: 100% reduction (i.e., you will get a score of 0).

Grading Scale:

	B+: 87 – 89	C+: 77-79	D+: 66 - 70
A: 93 – 100	B: 83 – 86	C: 73-76	D: 63 - 66
A-: 90 – 92	B-: 80 – 82	C-: 70-72	E: 62 or below

Grading a curve can have the unfortunate result that it may pit students against each other and penalize some of those students by adjusting their grades downward. As a result, I will not grade on a curve that

will penalize anyone by moving them downward. Your grade can only move upward. That is, for example, if the most that any student in the class received was 87%, I will add 13% to everyone's grade.

Course Policies
Your work should be original. Academic and personal misconduct are defined and dealt with according to the procedures in the Code of Student Conduct: http://studentlife.osu.edu/pdfs/csc_12-31-07.pdf. Avoid excessive quotation and paraphrasing of other's work with or without citation. While timely indication of one's intent to be absent is expected, when possible, this does not waive the obligation to submit assigned work on time.

ACADEMIC INTEGRITY (ACADEMIC MISCONDUCT) [2]
The Ohio State University and the Committee on Academic Misconduct (COAM) expect that all students have read and understand the University's *Code of Student Conduct*, and that all students will complete all academic and scholarly assignments with fairness and honesty. Failure to follow the rules and guidelines established in the University's *Code of Student Conduct* may constitute "Academic Misconduct." Sanctions for misconduct could include a failing grade in this course and suspension or dismissal from the University.

In the Ohio State University's *Code of Student Conduct*, Section 3335-23-04 defines academic misconduct as: "Any activity that tends to compromise the academic integrity of the University, or subvert the educational process." Examples of academic misconduct include (but are not limited to) plagiarism, collusion (unauthorized collaboration), copying the work of another student, and possession of unauthorized materials during an examination.[3] Ignorance of the University's *Code of Student Conduct* is never considered an "excuse" for academic misconduct. Other sources of information on academic misconduct (integrity) to which you can refer include:

- *The Committee on Academic Misconduct*: http://oaa.osu.edu/coam.html
- *Ten Suggestions for Preserving Academic Integrity*: http://oaa.osu.edu/coamtensuggestions.html
- *Eight Cardinal Rules of Academic Integrity*: www.northwestern.edu/uacc/8cards.html

If you have any questions about the above policy or what constitutes academic misconduct in this course, please contact me. I prefer to not have to make a decision on whether or not to bring someone up on charges of academic misconduct. For your sake and mine, please avoid coming close to the point where I have to make a decision.

Accommodation Policy

The University strives to make all learning experiences as accessible as possible. If you anticipate or experience academic barriers based on your disability (including mental health, chronic or temporary medical conditions), please let me know immediately so that we can privately discuss options. To establish reasonable accommodations, I may request that you register with Student Life Disability Services. After registration, make arrangements with me as soon as possible to discuss your accommodations so that they may be implemented in a timely

[2] From: http://oaa.osu.edu/coamfaqs.html#academicmisconductstatement
[3] If you have read this, email ogland-hand.1@osu.edu with the subject line "Woot woot! I read the 5600 syllabus before the end of the first week of class." and you will receive an extra percentage point on your final grade. P.S… don't tell others about this. Let them find it (or not) on their own. This offer expires one week into the semester.

fashion. SLDS contact information: slds@osu.edu; 614-292-3307; slds.osu.edu; 098 Baker Hall, 113 W. 12th Avenue.

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COURSE CALENDAR

Week	Day		Notes	Due	Topics	Readings and Assignments
1	Tu	1/8			**Introduction and Overview**	Neal, Ch. 1 - Science Policy; Bush (1945) - Science the Endless Frontier
	Th	1/10	1	1/13	**U.S. Science Policy in the World:** Leadership and Integration	Neal, Ch. 2 - Before/After Sputnik; SKIM Ch. 17 - Globalization
2	Tu	1/15	3	1/18	**U.S. Science Policy: Where is Policy Made?** Guest Lecture by Prof. Bharat Bhushan. U.S. Congressional Fellow '13-'14 **CONFIRMED**	Neal, Ch. 3 - Players in Science Policy; Neal, Ch. 4 - Process of Making Science Policy
	Th	1/17	5	1/20	**Federal Funding and the Role of States:** Guest Lecture by Prof. Bharat Bhushan. U.S. Congressional Fellow '13-'14 **CONFIRMED**	Neal, Ch. 5 - Federal Funding; Readings on Canvas
3	Tu	1/22	7	1/25	**Perspectives:** Policy Analysis for Scientists and Engineers; Science and Engineering for Policy Analysts	Readings on Canvas
	Th	1/24	9	1/27	**Frameworks for Policy Analysis; OSU Discovery Themes**	discovery.osu.edu; Readings on Canvas; SKIM Neal, Ch. 19 - Grand Challenges Paper and Presentation #1 assignment distributed
4	Tu	1/29	2	2/1	**U.S. Science and Engineering Research in Universities and Industry:** Guest Lecture by Dean David Williams, OSU College of Engineering **CONFIRMED**	Neal, Ch. 6 - Universities; Readings on Canvas; SKIM Neal, Ch. 8 - Industry; SKIM Neal, Ch. 15 - STEM Workforce
	Th	1/31	4	2/3	**Scientific Infrastructure**	Neal, Ch. 13 - Infrastructure; Readings on Canvas
5	Tu	2/5	6	2/8	**Processes and Templates for Discovery and Innovation**	Readings on Canvas
	Th	2/7	8	2/10	**Reproducibility, Revision, Re-evolution**	
6	Tu	2/12	10	2/15	**Case Study: Food Production and Security**	Readings on Canvas
	Th	2/14	1	2/17	**Case Study: Food Production and Security** Guest Lecture by Prof. Casey Hoy, Faculty Director of InFACT Discovery Theme **CONFIRMED**	Readings on Canvas
7	Tu	2/19			**Presentations (undergraduate students) #1**	**Paper #1 due 2/18 (Canvas)**
	Th	2/21			**Presentations (undergraduate students) #1**	Mid-Term distributed
8	Tu	2/26	2	3/1	**U.S. Science and Engineering in National Laboratories:** Guest Lecture by Dr. Richard Middleton, Los Alamos National Laboratory **CONFIRMED**	Neal, Ch. 7 - Federal Labs; Readings on Canvas
	Th	2/28	3	3/3	**Defense and Security**	Neal, Ch. 11 - Defense; Readings on Canvas; SKIM Neal, Ch. 18 - Homeland Security
9	Tu	3/5	4	3/8	**Case Study: Energy and Environment** Guest Lecture by Ms. Sarah Forbes, U.S. Department of Energy Headquarters **CONFIRMED**	Readings on Canvas
	Th	3/7	5	3/10	**Case Study: Energy and Environment**	Readings on Canvas **Mid-Term due Today**
10	Tu	3/12			**Spring Break - NO CLASSES**	**Rest**
	Th	3/14				
11	Tu	3/19	6	3/22	**Case Study: Health and Wellness,** Guest Lecture by Prof. Michael Oglesbee Director of OSU Infectious Disease Institute **CONFIRMED**	Readings on Canvas Paper and Presentation #2 assignment distributed
	Th	3/21	7	3/24	**Case Study: Health and Wellness**	Readings on Canvas
12	Tu	3/26	8	3/29	**Science, Engineering, and Policy in the Public Sector and the Private Sector,** Guest Lecture by Mr. Ferzan Ahmed, formerly of the Ohio Department of Transportation **CONFIRMED**	Neal, Ch. 9 - States Readings on Canvas
	Th	3/28	9	3/31	**Entrepreneurship and The Academy**	Readings on Canvas
13	Tu	4/2	10	4/5	**Ethics and Integrity, Regulations on Research,** Guest Appearance by Prof. Robyn Wilson, OSU School of Environment and Natural Resources **(?)**	Neal, Ch. 14 - Ethics Readings on Canvas
	Th	4/4			**Big Science,** Guest Lecture by Mr. Mark Reichanadter, Former Chief Operating Officer, Stanford Linear Accelerator Center National Accelerator Laboratory **CONFIRMED**	Neal, Ch. 12 - Big Science; SKIM Neal, Ch. 7 - Federal Labs; Readings on Canvas
14	Tu	4/9			**STEM Education; Science and Engineering Workforce**	Neal, Ch. 15 - STEM; Neal, Ch. 16 - Workforce
	Th	4/11			**Grand Challenges and The Future**	Neal, Ch. 19 - Grand Challenges; Neal, Ch. 20 - Nation's Future; Readings on Canvas
15	Tu	4/16			**Presentations (graduate students) #2**	**Paper #2 due 4/15**
	Th	4/18			**Presentations (graduate students) #2**	