

**PUBAFRS 5600 / ENVENG 5600: Science, Engineering, and Public Policy**  
**Tuesday/Thursday, 3:55-5:15, Bolz Hall 436**  
**Spring 2016**

**Jeffrey M. Bielicki, Ph.D.**

e-mail: [bielicki.2@osu.edu](mailto:bielicki.2@osu.edu)

*Department of Civil, Environmental,  
and Geodetic Engineering:*

Office: 483b Hitchcock Hall

Phone: (614) 688-2131

Office Hours: Tuesdays, 6:00-7:00pm, or by  
appointment

*The John Glenn School  
of Public Affairs:*

310c Page Hall

(614) 688-2113

Wednesdays, 4:00-5:00,  
or by appointment

**Teaching Assistant:**

Name: Paige Hagley

e-mail: [hagley.6@osu.edu](mailto:hagley.6@osu.edu)

office hours: Friday, 12:00-2:00, Bolz 243

**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.

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 Accelerator 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.

This course prepares engineering students to attain the following Accreditation Board of Engineering and Technology (ABET) educational objectives:

- (a) an ability to apply science and engineering knowledge;
- (c) an ability to operate within realistic constraints such as economic, environmental, social, political, ethical, and sustainability;
- (d) an ability to function on multi-disciplinary teams;
- (f) an understanding of professional and ethical responsibility;
- (g) an ability to communicate effectively;
- (h) the broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context;
- (i) a recognition of the need for, and ability to engage in, lifelong learning; and
- (j) a knowledge of contemporary issues.

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.

### **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).<sup>1</sup> 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

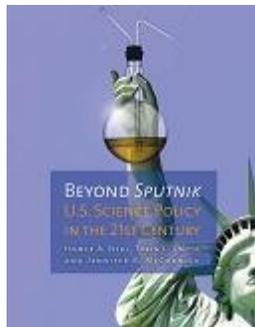
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<sup>1</sup> Please don't test me... I have worked for numerous national laboratories within the United States and still retain some privileges. In other words, I have certain resources at my disposal that are not available to the public... ☺

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 Carmen website for this course. The required textbook is:



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

You can access textbook information via the Barnes & Noble bookstore website: [www.shopOhioState.com](http://www.shopOhioState.com) as well as from your BuckeyeLink Student Center. This information is disseminated by Barnes & Noble to all area bookstores. You may buy from a store of your choice and/or shop for books online. (Use ISBN# for searches.)

**You are expected to read all of the readings prior to class.** 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, there will be a midterm exam, a final paper, and a class presentation based on that final paper.

### Grading and Assignment Detail

Class Participation (every session, first half, 01/10-02/23):	5%
Class Participation (every session, second half, 02/28-04/20):	5%
Class Notes (due as described in course calendar):	10%
Short Midterm (due March 3 <sup>rd</sup> ):	20%
Short Paper #1: Policy Analysis Frameworks (due 2/21):	20%
Short Paper #2: Policy Analysis Application (due 4/18):	25%
Presentation on Policy Analysis (undergraduate students, 2/21 or 2/23; graduate students, 4/18 or 4/20)	15%

### 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 Carmen discussion board.

Attendance necessary. If you need to miss class, please email me before that lecture. Absences without prior notification will be taken into account 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 23<sup>rd</sup>, and another grade for your participation in the second half of the course, February 28<sup>th</sup> through April 20<sup>th</sup>.

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 5:00 pm three days after the class session by email to the TA as a Microsoft Word document. I will review them and post them as a pdf to the course page on Carmen. 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 23<sup>rd</sup> and is due on March 3<sup>rd</sup>.

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 give an interesting, quality, informative, and engaging presentation.

*Short Paper #1:* The assignment will be distributed at the end of class on January 24<sup>th</sup> and is due by uploading to course website by 3:00 pm on February 21<sup>st</sup>. The assignment will have a list of approaches to policy analysis, where

- Undergraduate students will work in small 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 21<sup>st</sup> or 23<sup>rd</sup>.*

- 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 21<sup>st</sup> and is due by uploading to the course website by 3:00 pm on April 18<sup>th</sup>.

- Undergraduate students will work in small 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 18<sup>th</sup> or 20<sup>th</sup>.*

#### *Deadlines:*

Short Paper #1, Short Paper #2, and the Short Mid-term Exam must be uploaded to the Carmen course website by 3:00 pm of the day that they are due. The maximum number of points you can earn on each of these assignments will be reduced by each day that they are late, according to the following schedule:

- One day late (3:01pm on the day it is due to 2:59pm the following day): 50% reduction.
- Two days late (3:01pm on the day after it is due to 2:59pm the following day): 75% reduction.
- Three days late (3:01pm two days after it is due to 2:59pm 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](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) <sup>2</sup>**

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.

<sup>2</sup> From: <http://oaa.osu.edu/coamfaqs.html#academicmisconductstatement>

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.<sup>3</sup> 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](http://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 fashion. SLDS contact information: [slds@osu.edu](mailto:slds@osu.edu); 614-292-3307; [slds.osu.edu](http://slds.osu.edu); 098 Baker Hall, 113 W. 12<sup>th</sup> Avenue.

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<sup>3</sup> If you have read this, email [hagley.6@osu.edu](mailto:hagley.6@osu.edu) with the subject line "I read the SEPP during the first week of classes in 2017", and you will receive an extra two percentage points 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.

**Course Calendar:**

Week	Date	Notes	Due	Topic	Readings and Assignments
1	1/10			<b>Introduction and Overview</b>	Text, Ch. 1 (Science Policy) Bush (1945) – Science the Endless Frontier (on Canvas)
	1/12	1	1/15	<b>U.S. Science Policy in the World: Leadership and Integration</b>	Text, Ch. 2 (Before/After Sputnik) and SKIM Ch. 17 (Globalization)
2	1/17	3	1/20	<b>Perspectives: Policy Analysis for Scientists and Engineers; Science and Engineering for Policy Analysts;</b>	Readings on Canvas
	1/19	5	1/22	<b>Frameworks for Policy Analysis; OSU Discovery Themes</b>	Readings on Canvas discovery.osu.edu; Text, SKIM Ch. 19 (Grand Challenges)
3	1/24	7	1/27	<b>U.S. Science Policy: Where is Policy Made?</b> Guest Lecture by Bharat Bhushan, Professor, Mechanical Engineering. U.S. Congressional Fellow '13-'14. <b>CONFIRMED</b>	Text, Ch. 3 and Ch. 4; Paper and Presentation #1 assignment distributed
	1/26	9	1/29	<b>Federal Funding and the Role of States:</b>	Text, Ch. 5 (Federal Funding) NSF (2016) – Federal Budget Authority NSF (2016) – State Government R&D
4	1/31	2	2/3	<b>U.S. Science and Engineering in National Laboratories</b>	Text, Ch. 7 (Labs) Readings on Canvas
	2/2	4	2/5	<b>Defense and Security</b>	Text, Ch. 11 (Defense) and SKIM Ch. 18 (Homeland Security)
5	2/7	6	2/10	<b>Processes and Templates for Discovery and Innovation</b>	Readings on Canvas
	2/9	8	2/12	<b>Reproducibility, Revision, Re-evolution</b>	Readings on Canvas
6	2/14	10	2/17	<b>U.S. Science and Engineering Research in Universities and Industry,</b> Guest Lecture: Dean David Williams, OSU College of Engineering <b>CONFIRMED</b>	Text, Ch. 6 (Universities), Ch. 8 (Industry), and SKIM Ch. 15 (STEM) Readings on Canvas
	2/16	1	2/19	<b>Scientific Infrastructure</b>	Ch. 13 (Infrastructure) Readings on Canvas
7	2/21			Presentations (undergraduate students) #1	<b>Paper #1 due</b>
	2/23			Presentations (undergraduate students) #1	Mid-term distributed
8	2/28	2	3/4	<b>Case Study: Energy and Environment</b>	Readings on Canvas
	3/2	3	3/6	<b>Case Study: Energy and Environment</b> Guest Lecture by Elena Irwin, Professor, Faculty Lead, Sustainable and Resilient Economy Program, OSU Discovery Team <b>CONFIRMED</b>	Readings on Canvas <b>Mid-term due March 3<sup>rd</sup></b>
9	3/7	4	3/11	<b>Case Study: Food Production and Security</b>	Readings on Canvas
	3/9	5	3/20	<b>Case Study: Food Production and Security</b>	Readings on Canvas
10				<b>Spring Break: 3/14-3/18</b>	
11	3/21	6	3/24	<b>Case Study: Health and Wellness</b> <b>Case Study: Health and Wellness,</b> Guest Lecture by Mike Oglesbee, Professor, Faculty Lead, Infectious Disease Program, OSU Discovery Theme <b>CONFIRMED</b>	Readings on Canvas Paper and Presentation #2 assignment distributed
	3/23	7	3/26		Readings on Canvas
12	3/28	8	3/31	<b>Ethics and Integrity</b> <b>Regulations on Research</b>	Text, Ch. 14 (Ethics) Readings on Canvas
	3/30	9	4/2	<b>Science, Engineering, and Policy in States and Counties,</b> Guest Lecture:	Text, Ch. 9 (States)

				Ferzan Ahmed, formerly of the Ohio Department of Transportation <b>CONFIRMED</b>	Readings on Canvas
13	4/4	10	4/9	<b>Entrepreneurship and The Academy Big Science:</b> Guest Lecture by Mark Reichanadter, Project Manager Stanford Linear Accelerator Center National Accelerator Laboratory <b>CONFIRMED</b>	Readings on Canvas
	4/6				Text, Ch. 12 (Big Science) and SKIM Ch. 7 (Labs) Readings on Canvas
14	4/11			<b>STEM Education Science and Engineering Workforce Grand Challenges and The Future</b>	Text, Ch. 15 (STEM) and Ch. 16 (Workforce)
	4/13				Text, Ch. 19 (Grand Challenges) and Ch. 20 (Nation's Future) Readings on Canvas
15	4/18			Presentations (graduate students) #2	<b>Paper #2 due</b>
	4/20			Presentations (graduate students) #2	

SAMPLE