Seminar in Science and Technology Policy

Doctoral seminar on theory and practice in science and technology policy. Critical evaluations of interdisciplinary policy analyses. Practical application of analyses to policy questions and the implementation of policy choices in selected fields related to science and technology policy.

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Prerequisites: The course is intended for PhD candidates who have completed their core requirements. MA candidates who have completed the International Science and Technology Policy Cornerstone Seminar (IAFF 6141) may also take the course.

Required Textbooks:
- Custom Course Pack

Additional Books Not in Custom Course Pack:

Useful Resources on the Web
• *Issues in Science and Technology* (National Academy of Sciences) [http://www.issues.org/](http://www.issues.org/)
• White House Office of Science and Technology Policy (also see the blog) [http://www.ostp.gov](http://www.ostp.gov)
• The National Academies (NAS, NAE, IOM, NRC) [http://nas.edu/](http://nas.edu/)
• *Science* (the journal; also see their Sciencemag blog) [http://www.sciencemag.org/](http://www.sciencemag.org/)
Student Learning Objectives: Course content and requirements are designed to develop students’ knowledge and skill in:

1. Understanding and being able to precisely use key terms and concepts found in modern interdisciplinary analyses of science and technology policy issues.
2. Developing and testing theories and models;
3. Framing and developing good researchable questions;
4. Designing effective approaches to address research questions;
5. Recognizing and understanding ethical and political issues that arise in conducting and reporting research; and
6. Reporting on one’s own research and on studies conducted by others in a clear manner.

Course Requirements:

1. Class participation. The class is a doctoral seminar, relying on active participation by all students. I expect students to complete all readings, and participate fully in class discussion. Students should come with at least one discussion question for the class to discuss on each reading. **AND each student will be asked to present the basics about a reading for each week’s topic and discuss how it relates to the selection of research questions, the design and conduct of analysis, and/or the communication of results.** S/he should provide a brief summary to the class on the night s/he presents. (10% of grade).

2. **Written Assignments.**

   a. Article Critique (Due February 29): Students are asked to select an S&T policy research article of their choosing and submit a written critique of approximately four pages in the following format:

   1) A brief description of the focus and findings;
   2) Identification of the key research questions addressed;
   3) A brief summary of the research design, data collection methods used, and the analysis conducted;
   4) A systematic list of threats and weaknesses to the research and its findings. This can include, for example, measurement validity and measurement reliability, internal validity and external validity, and statistical conclusion validity. Note that the threats should be clearly presented, how/why that threat occurred, and labeled as those the authors acknowledged and threats the authors did not acknowledge. (15% of grade)

   b. Research Synthesis (Due March 21): Students are asked to perform a systematic analysis of a set of (at least six) empirical research articles and/or reports in a subject area of their choosing. The written report should include a synthesis of the
studies plus a matrix with a series of columns containing at a minimum the following information on each piece of research (typically in bullet form):

1. Author and year
2. Primary research questions
3. Research design
4. Data collection techniques, types of sampling, and sample size
5. Data analytical techniques
6. Key findings
7. Communication mode and intended audiences
8. Limitations and robustness of the findings and conclusions (25% of grade)

3. Research Proposal. Each student will present a research proposal that could potentially be developed into a dissertation topic. The final proposal should be about 12,000 words. Presentations will be 30 minutes with 30 minutes for questions and discussion. (50% of grade)

Class Schedule and Assignments

Session 1 (January 18)

What is science policy?
   Scope of the field. Policy for science, science for policy. Recent history of science in the US. Growth of the science policy field in parallel with growth of science itself. S&T organizations in the US and other countries.

Beyond Sputnik, Chapter 1: “Science Policy Defined” and Chapter 2: “U.S. Science Policy before and after Sputnik.”


**Session 2 (January 25)**

**US science policy – Who’s who and what’s what**

Federal government institutions, states and the private sector. Budgeting and policy – how S&T fits in a larger picture. Statistical picture of U.S. science; relations to the rest of the world. The U.S. research establishment – industry, government, universities – their respective roles and relations.


**Session 3 (February 1)**

**Social, political and economic structure of science**

Science as a meritocracy. Basic research, applied research, etc. Scientific publication, priority and intellectual property. Ethics and scientific integrity.
Sociology of science and scientific institutions.


**Session 4 (February 8)** Student presentations on designs.

**Science and foreign policy**

Science as an instrument of foreign policy. Science diplomacy. Scientific involvement in international relations – from the Enlightenment to the Cold War to the present day. International institutions, multilateral agreements, NGOs and other groups. Comparative National Science Institutions U.S., UK, Germany, Continental Europe, Japan, Brazil, Soviet experience, India, China


**Session 5 (February 15)** Student presentations on designs.

**Science in economic development**
Role of science and technology in developing countries at different stages of economic development. S&T in development assistance. Building scientific communities in developing nations.


**Session 6 (February 22)**

**National innovation systems**
Comparative approaches to science and technology as a means of promoting economic growth in developed nations. Economics of innovation. Role of R&D and human resources. Development of the corporation and private R&D.


Session 7 (February 29) *****ARTICLE CRITIQUE DUE*****

**Regulations and science**

Risk and risk communication. How uncertainty affects the role of science in policy. Comparative regulatory systems (e.g., regulation of GMOs in Europe, the U.S., and elsewhere). Role of bureaucracy and regulation in policy decisions. Regulation of science (hazardous research, use of animals, etc.)


Session 8 (March 7)

Big science


Beyond Sputnik, Chapter 12: “Big Science”


Session 9 (March 21) *****RESEARCH SYNTHESIS DUE*****

Human resources for science and engineering

STEM education. The employment picture for scientists and engineers.

International mobility, visas, different national perspectives.

Beyond Sputnik, Chapter 15: “Science, Technology, Engineering, and Mathematics Education” and Chapter 16, “The Science and Engineering Workforce”

Committee on Science, Engineering and Public Policy, Rising Above the Gathering Storm: Energizing and Employing America for a Brighter Economic Future, National


Session 10 (March 28)
Health, biomedical research, and biotechnology
Public and private funding of biomedical R&D. Translational research – how does biomedical research affect human health care. Emergence of biotechnology in the past 40 years. “Big pharma.”


Session 11 (April 4)
Science, technology and the military


Session 12 (April 11)

**Science and democracy – public participation in science policy**


*Beyond Sputnik*, Chapter 10: “The Public”


Appendices are optional.


Session 13 (April 18)
Current Issues and Special topics [students to choose one]
- Space
- Energy
- Environment and/or global climate change
- Emerging technologies: Synthetic biology, Nano
- Information and communications technology
- Aviation
- Transportation (other than aviation)
- STEM Education
- Etc.

Session 14 (April 25)
Make up session

****Research Proposal Presentations (May 2) During Finals Week****
Depending on the number of students, this session may be combined with Session 13 to provide sufficient time.

Addendum
This course focuses on science policy and politics. Another instructor might tilt it toward methodology and prompt students to think more specifically about dissertations. An alternative emphasis might:

1. Add more quantitative and economics material in the sense of the “Economics of Technological Change” course by Prof. Vonortas. That course covers many concepts there that a doctoral candidate might need for a dissertations, e.g., externalities, spillovers, network economies, IPR, industry evolution, knowledge diffusion, foreign investment, risk finance, business and technology cycles, etc.

2. Add material on R&D and innovation program evaluation. This could be a combination of qualitative and quantitative methods, e.g., case studies, interviews and surveys to intensive econometrics and modeling. Full class sessions could be devoted to creating survey instruments, case studies, and more than one class for modeling. On the other hand, there are research methods classes that cover these topics already.

3. Add discussions of available policy tool suites, such as (a) regulatory instruments (IPR, standards, anti-trust, and ethics (nano, bio), (b) financial and economic instruments (subsidies, tax incentives, loans, loan guarantees, risk capital, private equity), and (c) soft instruments such as pilots and demonstrators, training and capacity building, information campaigns, open dialogue and platforms, public private partnerships, etc.
Policies in The Trachtenberg School Courses

1. **Incompletes:** A student must consult with the instructor to obtain a grade of I (incomplete) no later than the last day of classes in a semester. At that time, the student and instructor will both sign the CCAS contract for incompletes and submit a copy to the School Director. Please consult the TSPPPA Student Handbook or visit our website for the complete CCAS policy on incompletes.

2. **Submission of Written Work Products Outside of the Classroom:** It is the responsibility of the student to ensure that an instructor receives each written assignment. Students can submit written work electronically only with the express permission of the instructor.

3. **Submission of Written Work Products after Due Date: Policy on Late Work:** All work must be turned in by the assigned due date in order to receive full credit for that assignment, unless an exception is expressly made by the instructor.

4. **Academic Honesty:** Please consult the “policies” section of the GW student handbook for the university code of academic integrity. Note especially the definition of plagiarism: “intentionally representing the words, ideas, or sequence of ideas of another as one’s own in any academic exercise; failure to attribute any of the following: quotations, paraphrases, or borrowed information.” All examinations, papers, and other graded work products and assignments are to be completed in conformance with the George Washington University Code of Academic Integrity.

5. **Changing Grades After Completion of Course:** No changes can be made in grades after the conclusion of the semester, other than in cases of clerical error.

6. **The Syllabus:** This syllabus is a guide to the course for the student. Sound educational practice requires flexibility and the instructor may therefore, at her/his discretion, change content and requirements during the semester.

7. **Accommodation for Students with Disabilities:** In order to receive accommodations on the basis of disability, a student must give notice and provide proper documentation to the Office of Disability Support Services, Marvin Center 436, 202-994-8250. Accommodations will be made based upon the recommendations of the DSS Office.