EGR 494/FIS 494: The Politics of Science and Engineering

Instructor: Darshan M.A. Karwat
Classroom: SANCA 151 on the Polytechnic Campus
Class time: Tuesdays, 1:30 to 4:15 pm
Office hours: Tuesdays, 10 am to noon, or by appointment

Course overview: This class poses three fundamental questions: Why are we engineers? Who do we work for? What is the full measure of our moral and social responsibility? Through discussion and written reflection, this class will be a space in which we will challenge the assumptions we make in what it means to be an engineer, with the goal of being prepared to bring our *full* selves—not only our technical selves—to being professional engineers and to being constructive members of communities tackling complex social, technical, and ecological problems.

Learning outcomes: By the end of this course, you will have

- a personal answer to the three fundamental questions posed in this class;
- a knowledge of the history and professionalization of engineering;
- an understanding that science and engineering are political processes, including everything from where engineering education comes from to who engineers work for and how;
- an understanding of who/what the "public" is in engineering work, and an ability to map stakeholders affected by engineering work; and
- an understanding of the contours of the ethical and the justice implications of engineering work.

Class structure, format, and makeup: This three-credit class will be seminar-based, meeting once a week for three hours for instruction, presentations, and discussions. There will be guest lectures from experts in different areas of the issues covered in class. Readings will include reports, journal papers, news articles, multimedia, and book chapters. The class is reading-heavy, and participants will be expected to critically read, analyze, and critique writing, and openly discuss their thoughts. The success of this class will be based in large part on the engagement of all participants.

Course policies

- The classroom will be a space of respect, honesty, self-responsibility, and collaborative thinking, and will be an environment to help all of us—including the instructor and guest lecturers—think of positive futures for the engineering profession. We are all in this together.
- We will be addressing topics that are controversial and provocative, and that may challenge people's worldviews.
- We must all acknowledge that there are a variety of perspectives on the complex issues we will discuss, and each participant in class is always free to express their opinions; however, you may be asked to question your own opinions openly.
- You are free to disagree with the conclusions of the instructors and presenters, your peers and colleagues, or the authors you read.
- Your prepared, on-time presence in class without distraction will make the classroom an incubator of discussion, learning, growth, and action.

- Academic integrity is essential in every pursuit. Citing and referencing the ideas of others in your own work will give others confidence in it, even if they disagree with you.
- Laptops will not be allowed for taking notes and phones must be kept inside your bags.
- Absences and coming to class late will not be allowed other than for extenuating circumstances. If you think you won't be able to make class, inform me prior to class for make-up arrangements.
- Disruptive, threatening or violent behavior will be dealt with according to the policies in the Student Services Manual, SSM 104–02. Students wishing to record lectures electronically must first get permission from the instructor.
- Depending on the nature of the absence the instructor may elect to deduct points from your overall grade. Absences can be excused for religious observances or practices that are in accord with ACD 304–04 or university sanctioned events/activities that are in accord with ACD 304–02.
- Incompletes**:** A mark of "I" (incomplete) can be given by the instructor when you are otherwise doing acceptable work but are unable to complete the course because of illness or other conditions beyond your control. You are required to arrange with the instructor for the completion of the course requirements. The arrangement must be recorded using the form at http://students.asu.edu/forms/incomplete-grade-request. Students should be proactive and discuss this with their instructor and TA before the end of the semester. Students who do not complete this form before the end of the semester cannot be given an incomplete and will be awarded a grade based on the work they have completed.
- Late assignments will NOT be accepted.
- Grade appeals: ASU has formal and informal channels to appeal a grade. If you wish to appeal any grading decisions, please see: http://catalog.asu.edu/appeal
- Student standards: Students are required to read and act in accordance with university and Arizona Board of Regents policies, including: The ABOR Code of Conduct: Arizona Board of Regents Policies 5-301 through 5-308: http://www.azregents.edu/policymanual/default.aspx
- Academic integrity: Academic honesty is expected of all students in all examinations, papers, laboratory work, academic transactions and records. The possible sanctions include, but are not limited to, appropriate grade penalties, course failure (indicated on the transcript as a grade of E), course failure due to academic dishonesty (indicated on the transcript as a grade of XE), loss of registration privileges, disqualification and dismissal. For more information, see http://provost.asu.edu/academicintegrity.

  If you fail to meet the standards of academic integrity in any of the criteria listed on the university policy website, sanctions will be imposed by the instructor, school, and/or dean. Academic dishonesty includes borrowing ideas without proper citation, copying others' work (including information posted on the internet), and failing to turn in your own work for group projects. Please be aware that if you follow an argument closely, even if it is not directly quoted, you must provide a citation to the publication, including the author, date, and page number. If you directly quote a source, you must use quotation marks and provide the same sort of citation for each quoted sentence or phrase. You may discuss assignments with other students, however, all writing that you turn in must be done independently. If you have any doubt about whether the form of cooperation you contemplate is acceptable, ask the TA or the instructor in advance of turning in an assignment. Please be aware that the work of all students submitted electronically can be scanned using SafeAssignment, which compares them against everything posted on the internet, online article/paper databases, newspapers and magazines, and papers submitted by other students. Turning in an assignment (all or in part) that you completed for a

previous class is considered self-plagiarism and falls under these guidelines. Any infractions of self-plagiarism are subject to the same penalties as copying someone else's work without proper citations.

- Prohibition of commercial note taking services: In accordance with ACD 304-06 Commercial Note Taking Services, written permission must be secured from the official instructor of the class in order to sell the instructor's oral communication in the form of notes. Notes must have the note taker's name as well as the instructor's name, the course number, and the date.
- Student support and disability accommodations: In compliance with the Rehabilitation Act of 1973, Section 504, and the Americans with Disabilities Act of 1990, professional disability specialists and support staff at the Disability Resource Center (DRC) facilitate a comprehensive range of academic support services and accommodations for qualified students with disabilities. Qualified students with disabilities may be eligible to receive academic support services and accommodations. Eligibility is based on qualifying disability documentation and assessment of individual need. Students who believe they have a current and essential need for disability accommodations are responsible for requesting accommodations and providing qualifying documentation to the DRC. Every effort is made to provide reasonable accommodations for qualified students with disabilities. Qualified students who wish to request an accommodation for a disability should contact their campus DRC at: http://www.asu.edu/studentaffairs/ed/drc/ If you are a student in need of special arrangements we will do all we can to help, based on the recommendations of these services. For the sake of equity for all students, we cannot make any accommodations without formal guidance from these services.
- Drop and add dates/withdrawals: Please refer to the academic calendar on the deadlines to drop/withdraw from this course. Consult with your advisor and notify your instructor if you are going to drop/withdraw this course. If you are considering a withdrawal, review the following policies: Withdrawal from Classes, Medical/Compassionate Withdrawal.
- Email communications: All email communication for this class will be done through your ASU email account and the Blackboard site. You should be in the habit of checking your ASU email regularly as you will not only receive important information about your class(es), but other important university updates and information. You are solely responsible for reading and responding if necessary to any information communicated via email. For help with your email go to: http://help.asu.edu/sims/selfhelp/SelfHelpHome.seam?dept_pk=822 and file a help desk ticket by clicking on "My Help Center."
- Campus resources: As an ASU student you have access to many resources on campus. This includes tutoring, academic success coaching, counseling services, financial aid, disability resources, career and internship help and many opportunities to get involved in student clubs and organizations.
    - Tutoring and writing help: https://tutoring.asu.edu/tutoring
    - Counseling Services: http://students.asu.edu/counseling
    - Financial Aid: http://students.asu.edu/financialaid
    - Major/Career Exploration: https://cls.asu.edu/majorexploration
    - Career Services: http://students.asu.edu/career
    - Student Organizations: http://www.asu.edu/studentaffairs/mu/clubs/
- For graduate students: In addition to in-person writing tutoring for undergraduate students at all four campus locations, UASP also have five ASU Graduate Writing Centers to specifically serve students enrolled in 500, 600 and 700 level classes. These centers offer appointment-based writing assistance for graduate students as well as space to read, write, and discuss their graduate research and writing projects. This assistance allows students to meet with a graduate writing consultant to receive feedback

on their writing projects at any stage in their development and writing process. Details at https://tutoring.asu.edu/student-services/graduate.

Assignments and grading

- **News articles of interest:** 1.5% each x 12 = 18% (due at the start of session)
- **Reflection papers:** 3.5% each x 12 = 42% (due at the start of session)
- **Personal portfolio:**
  - **Ethics card:** 5% (due November 28 @ start of class)
  - **Story of Self:** 7.5% each x 2 = 15% (first one due at the start of session 2; second one due December 5 @ 11:59 pm)
- **General participation in class**: 20%

Important! The syllabus, requirements for the course, grading, and other things are subject to change!

WEEK 1 [Aug 22]: What does engineering look like today?

- Overview of class and assignments
- Discussion: What is "politics?" Are science and engineering "social" processes? If so, how? Where do resources for science and engineering come from? What authority do science and engineering have? Who prioritizes what happens in science and engineering? How do you evaluate the success and failure of engineering projects?

WEEK 2 [Aug 29]: History of engineering: Where did the profession come from?

Required readings

- Edwin Layton Jr. (1971), *The Revolt of the Engineers*, Chapter 1, *The Engineer and Business*
- David Noble (1977), *America by Design*, The Emergence of the Professional Engineer, Chapter 3
- Peter Meiksins and Chris Smith (1996): *Engineering Labour,* Chapter 8, A Comparative Perspective on the Organization of Technical Work

Assignments due at start of class

- *Story of Self* 1
- *News article*
- *Reflection paper*

WEEK 3 [Sept 5]: Where does our education come from? History and today

Required readings

- *Watered-Down Gen Ed for Engineers?* Inside Higher Ed
- David Noble (1977), *America by Design*, The Development of Technical Education, Chapter 2
- Terry Reynolds (1992), *The Education of Engineers in America Before the Morrill Act of 1862*, History of Education Quarterly, Vol 32. No. 4
- Gary Lee Downey (2007), *Low Cost, Mass Use: American Engineers and the Metrics of Progress*, History and Technology, Vol 23, No. 3, pp. 289-308

Assignments due at start of class

- *News article*
- *Reflection paper*

WEEK 4 [Sept 12]: Where do numbers come from? What power do they allow?

Required readings and multimedia

- Theodore Porter (1995), *Trust in Numbers*, US Army Engineers and the Rise of Cost-Benefit Analysis, Chapter 7
- Richard Lewontin and Richard Levins (2007), *Biology under the Influence*, Let the Numbers Speak, Chapter 12, and The Politics of Averages, Chapter 13
- *"On Average"* by 99% Invisible [LISTEN and READ] (http://99percentinvisible.org/episode/on-average/)

Assignments due at start of class

- *News article*
- *Reflection paper*

WEEK 5 [Sept 19] The "public" and democracy in technological design

Required readings

- Sheila Jasanoff (2003), *Technologies of Humility: Citizen Participation in Governing Science*, Minerva, Vol. 41, pp. 223-244
- David Zimmerman (1995), *Toward a More Democratic Ethic of Technological Governance*, Science, Technology, & Human Values

Assignments due at start of class

- *News article*
- *Reflection paper*

WEEK 6 [Sept 26] Engineering ethics, philosophy, and the "public good"

Required readings

- Caroline Whitbeck (1996), *Ethics as design: Doing justice to moral problems*
- Abbas El-Zein and Chris Hedemann (2016), *Beyond Problem Solving: Engineering and the Public Good in the 21st century*, Journal of Cleaner Production

Assignments due at start of class

- *News article*
- *Reflection paper*

WEEK 7 [Oct 3] Idealized models of engagement in policy: from honest broker to stealth advocate (Guest speaker: Angela Bednarek, Project Director in Environmental Science, The Pew Charitable Trusts)

Required readings

- Robert Pielke Jr. (2007), The Honest Broker: Making Sense of Science in Policy and Politics
  - Four idealized roles of science in policy and politics, Chapter 1
  - The big picture, science, and democracy, Chapter 2
  - Science and decision-making, Chapter 3
  - Values, Chapter 4
  - Uncertainty, Chapter 5

Assignments due at start of class

- *News article*
- *Reflection paper*

WEEK 8 [Oct 10] Science and technology studies: canonical readings

Required readings

- Langdon Winner (1986), *The Whale and the Reactor*, Chapter 2: Do Artifacts Have Politics?
- David Nye (2006), *Technology Matters*, Chapter 2: Does Technology Control Us?
- Thomas Hughes (2012), *The Evolution of Large Technological Systems* in Wiebe Bikjer, Thomas Hughes, and Trevor Pinch, *The Social Construction of Technological Systems*

Assignments due at start of class

- *News article*
- *Reflection paper*

WEEK 9 [Oct 17] Engineering, fossil fuels, and environmental justice

Required readings

- Gwen Ottinger (2013), *Refining Expertise: How Responsible Engineers Subvert Environmental Justice Challenges*
    - Chapter 1: The Battlefront
    - Chapter 5: Responsible Refiners
- Deborah Johnson (1989), *The Social/Professional Responsibilities of Engineers*, Annals of the New York Academies of Sciences

Assignments due at start of class

- *News article*
- *Reflection paper*

WEEK 10 [Oct 24] Science, complexity, and capitalism

Required readings and multimedia

- Richard Levins and Richard Lewontin (1985), *The Dialectical Biologist*, The Commodification of Science, Chapter 8
- Richard Lewontin and Richard Levins (2007), *Biology Under the Influence*, Is Capitalism a Disease? The Crisis in US Public Health, Chapter 27
- (Watch) Richard Levins's presentation at *Science for the People: The 1970s and Today* (2014), "One Foot In, One Foot Out" [start at minute 45]
- (Listen) Richard Lewontin, "Biology as Ideology – Lecture 1"

Assignments due at start of class

- *News article*
- *Reflection paper*

WEEK 11 [Oct 31] Movements and activism in science and engineering

Required readings

- Kelly Moore (2009), *Disrupting Science: Social Movements, American Scientists, and the Politics of the Military, 1945-1975*,
    - Confronting Liberalism: The Anti-Vietnam War Movement and the ABM Debate, 1965-1969, Chapter 5
    - Doing "Science for the People": Enactments of a New Left Politics of Science, Chapter 6
- Union of Concerned Scientists Founding Statement
- Science for the People (1971), *Science for the People*

Assignments due at start of class

- *News article*
- *Reflection paper*

WEEK 12 [Nov 7] Whistleblowing in engineering (with guest speaker Karen Tanenbaum, US Office of Special Counsel, and Dr. Jean Maria Arrigo, APA-CIA whistleblower)

Required readings TBD

Assignments due at start of class

- *News article*
- *Reflection paper*

Week 13 [Nov 14] The end of the world: nuclear weapons (with possible guest speaker Zia Mian, The Program on Global Security, Princeton University)

Required readings

- Paul Rubinson (2011), "*Crucified on a Cross of Atoms": Scientists, Politics, and the Test Ban Treaty*, Diplomatic History, Vol 35, No. 2
- (Watch) *Edward Teller and Linus Pauling Debate* (1958), KQED
- Jay Bergman (2009), *Meeting the Demands of Reason: The Life and Thought of Andrei Sakharov*, Chapter 9, *A Dissident At Last*

Assignments due at start of class

- *News article*
- *Reflection paper*

Extra readings and multimedia of interest

- (Watch) *Nuclear Requiem* (2016)
- Melinda Gormley, Melissae Fellet (2015), *The Pauling-Teller Debate: A Tangle of Expertise and Values*, Issues in Science and Technology
- (Watch) Defending Andrei Sakharov & the 'Attack Corruption First' Theory Defeating Public Apathy in Russia
- American Experience (2017), *Command and Control*
- Albert Einstein and Bertrand Russell (1955), *The Russell-Einstein Manifesto*
- (Watch) *The Day After Trinity*

Week 14 [Nov 21] Poisoned Water: The Flint Water Crisis (with guest speaker Yanna Lambrinidou, Virginia Tech)

Required reading and multimedia

- (Watch) PBS Nova (2017), *Poisoned Water*
- Anna Maria Barry-Jester (2016), *What Went Wrong in Flint*, fivethirtyeight.com
- Julie Mack (2016), *Flint water crisis: 8 things to know about role of engineering firms*, MLive.com

Assignments due at start of class

- *News article*
- *Reflection paper*

Other resources

- (Listen) Michigan Radio (2015), *Not Safe to Drink*
- (Listen) Michigan Radio (2017), *3 years later, the Flint water crisis has changed how other cities deal with infrastructure*
- Terese Olsen (2016), The science behind the Flint water crisis: corrosion of pipes, erosion of trust, *The Conversation*
- Donovan Hohn (2016), *Flint's Water Crisis and the "Troublemaker" Scientist*, NYT Magazine

Week 15 [Nov 28] Barriers not bridges: The politics of walls: Israel-Palestine and US-Mexico

Required readings TBD from below

- US Department of Homeland Security (2017), *Solid Concrete Wall RFP*
- US Department of Homeland Security (2017), *Other Border Wall RFP*
- Tom Vanderbilt (2016), *The Walls in Our Heads*, NYTimes

- Samer Alatout (2009), *Walls as Technologies of Government: The Double Construction of Geographies of Peace and Conflict in Israeli Politics, 2002-Present*, Annals of the Association of American Geographers
- Mitchel Bard (2017), *West Bank Security Fence: Background & Overview*, Jewish Virtual Library
- Haggai Matar (2012), *The Wall, 10 years on* (1, 2, 3, 4, 5, 6, 7, 8, 9, 10), +972
- David Rogers (2016), *Israeli company keen to build Trumps 1,000-mile Mexican wall*, Global Construction Review
- Darshan Karwat (2017), *Why Engineers Should Refuse to Build Trump's Wall*, Future Tense
- Danny Tirza (2012), *Israeli Security Fence Architect: Why The Barrier Had to Be Built*, ALMonitor
- Todd Miller and Gabriel Schivone (2015), *Gaza in Arizona: How Israeli High-Tech Firms Will Up-Armor the US-Mexico Border*, Tom Dispatch
- Rodrigo Nieto-Gomez (2014), *Walls, Sensors and Drones: Technology and Surveillance on the US-Mexico Border* in Elizabeth Vallet, *Borders, fences and walls: state of insecurity?*
- Ronald Rael (2014), *Border Wall as Architecture* in Elizabeth Vallet, *Borders, fences and walls: state of insecurity?*
- *IMPACT OF THE FIRST PHASE OF THE SECURITY BARRIER ON THE QALQILYA, TULKARM, AND JENIN DISTRICTS, GAZA CITY, JULY 2003*, Journal of Palestine Studies
- Michael Deari (2016), *The World Is Full of Walls That Don't Work*, Politico
- Sarah Topol (2009), *Gaza border: Why Egypt is building a steel underground wall*, CS Monitor

Assignments due at start of class

- *News article*
- *Reflection paper*
- *Ethics card*

Week of finals [December 5] Final assignment due by December 5 at 11:59 pm by email

- *Story of Self* 2