HPSC0061 Emerging Technologies and responsible innovation

Course Syllabus

Course description

This course goes inside technology to discuss its political and ethical dimensions. Technologies shape our future in powerful and largely unaccountable ways. Are they inevitable, or can we control the technologies that we get, anticipate the implications, prevent hazards and share the benefits? Is innovation 'organised irresponsibility'? As science introduces new risks and ethical questions, what should governments do to control research and innovation? The course teaches students to think and write clearly and critically about new technologies. Case studies include self-driving cars, geoengineering and genetic engineering. We will use ideas from ethics, sociology of science, philosophy of technology and science policy studies. Assessment is through an essay and a pair of blog posts.

Basic course information

Moodle Web site:	https://moodle.ucl.ac.uk/course/view.php?id=7464
Assessment:	Coursework 1: blog posts (total 2,500 words) Coursework 2: essay (3,000 words) (50% each)
Timetable:	www.ucl.ac.uk/sts/hpsc
Prerequisites:	No pre-requisites.
Required texts:	No required texts for the course overall, but particular readings are required for each week
Course tutor(s):	Jack Stilgoe
Contact:	j.stilgoe@ucl.ac.uk
Web:	www.ucl.ac.uk/sts/staff/stilgoe
Office location:	22 Gordon Square, Room 3.2
Office hours (online):	Tuesdays 11:30-1:30pm

Schedule

UCL Week	Week beginning	Topic	Activity
6	5 Oct	**"Tech"**	Do essential reading before each seminar
7	12 Oct	**The politics of technology**	
8	19 Oct	**Problems, solutions and technological fixes**	
9	26 Oct	**Technology as a social experiment**	Draft blog post one due 26 Oct
10	2 Nov	**Risk, uncertainty and precaution**	
12	9 Nov	**Reading Week**	
11	16 Nov	**Expectations and hype**	
13	23 Nov	**Patents, standards and platforms**	
14	30 Nov	**Science, technology and inequality**	
15	7 Dec	**Responsibility and Frankenstein**	Both blog posts due 7 Dec
16	14 Dec	**TBC**	
			Essay due 11 Jan

Assessments

	Description	Deadline	Word limit
Blog posts	Draft blog post one (submitted as a URL)	12 pm, 26 Oct	Total 2,500
	Blog posts one and two (uploaded via Moodle)	5 pm, 7 Dec	
Essay	See titles below	5pm, 11 Jan	3,000

Assignments

In order to be deemed 'complete' on this module, students must attempt the blog posts and the essay. The blog posts and the essay must be submitted via Moodle. Blog posts should ideally be published online, where they can be viewed and commented upon by others. Blog posts will be discussed in class and feedback provided by peers as well as the course tutor. Blog posts should be fully hyperlinked. We will discuss in class what makes for a good blog post, and students will be supported in their writing. Students will in general be expected to demonstrate that they have

understood the ideas and approaches of the course and are able to apply them in a readable way to topical and emerging issues. They will be expected to research issues online and demonstrate this with hyperlinks. Students will be assessed on style as well as substance. The assumption will be that students' blogging skills develop over the course of the term, with help from their colleagues and the course tutor.

Feedback on blog posts and provisional marks will be returned two weeks after the deadline.

Essay Titles

1. Given Collingridge's dilemma of control, how should we technologies be governed before they get locked in? Use historical and/or contemporary examples.
2. In what ways might we see self-driving cars as a social experiment? How could this change the governance of the technology?
3. What might a responsible innovation approach to genome editing in human beings look like?
4. Could geoengineering be a technological fix for climate change?
5. Using examples, discuss if new technologies inevitably widen social inequalities and how they might be governed to reduce inequalities
6. What's wrong with technological hype?

(Students are free to suggest their own alternative essay topics, but they must be agreed with me)

Criteria for assessment
The departmental marking guidelines for individual items of assessment can be found in the STS Student Handbook.

Blogs
Above these criteria, the blog posts will also be marked for the accessibility and clarity of their writing in blog posts.

Essay
In addition to the criteria indicated in the STS Student Handbook, the following are the main criteria on which your essay will be marked. There are no set numbers/ percentages associated with these criteria but we will give you qualitative feedback based on them.

1. Answer the question
Read the question carefully and answer it specifically – do not give irrelevant material or drift into answering other questions.

2. Organisation
Is the essay organized into an introduction, main body and conclusion? Does each part flow naturally into the next one? Is the evidence in a logical order? Using signposting sentences (in this section I will argue that…) will help.

3. Introduction

You should give an introduction to your essay in no more than one or two paragraphs. Introduce your topic and your line of argument, no more. Good introductions are concise and precise.

4. Clarity

We place great emphasis on clarity of argument and expression. Avoid ambiguity and vagueness. Do not assume your reader already knows what you are talking about. Try to keep your line of argument clear. It often helps clarity to divide the main body of the essay into sections (typically three or four for a 2500 word essay). Accurate spelling, grammar, punctuation and simple, active sentence structure also improve clarity.

5. Argumentation

Is the main argument of the essay clear, coherent and persuasive? Is it properly supported by the evidence available?

6. Conclusion

Your essay should have a conclusion that is clearly marked as such (new paragraph, 'In conclusion…'). It should be substantial in summing up what you have argued and exploring the implications of what you have argued.

7. Reading/ use of sources

How well have the readings and other resources been used? Does the essay reflect them accurately? Is the essay overly dependent on one source?

8. Independent critique?

Does the essay offer some independent critique or thought on the question or does it merely report what is in the literature? In Masters-level courses this is an essential component of essays.

9. Referencing

You must reference all quotes and all references/ summaries of books, etc. Pick one system for referencing and stick to it. Refer to individual page numbers, not just whole texts, whenever possible. Making use of ideas from or paraphrasing material without clearly referencing the original source is plagiarism and has incurs serious penalties.

10. Bibliography

You need to supply a bibliography of all works referenced at the end of your essay. You must supply author, title, date, place of publication and publisher.

Aims & objectives

The aims of this course are to get students to think and write critically about the directions of science and technology, taking into account social, political, economic and ethical questions.

By the end of this course, students will be familiar with a number of case studies of emerging technologies and they will be able to apply the lessons from these to other areas of science and technology. The idea is to study concepts and cases in lectures, discuss them in seminars and apply them to new areas at the frontiers of science and innovation through students' own writing. In addition to assessment via essay, the course also asks students to write accessibly and publicly, via a blog, about new technologies.

Reading list

These are **essential** readings for discussion in class. You are expected to have read and be able to talk about the essential reading. If you have time, you should also read the **recommended** pieces. It is also expected that you will explore additional material to inform your blogs, essays and class discussions.

Additional readings, referred to in lectures and to inform discussion, blog posts and essays, will be put on Moodle**.**

General readings
- There are some useful readings in this collection: Johnson, D. G., & Wetmore, J. M. (2009). Technology and society: building our sociotechnical future. MIT Press. Available online
- For an introduction to the course and you want to know what I think about these issues, see Stilgoe, J (2020) Who's Driving Innovation? New technologies and the collaborative state (Palgrave). Available online through UCL library

1. 'Tech'

The first week will introduce the module's key questions, case studies and approaches. We will ask what technology does in the world and why we should care about it.

Essential reading
- Ch. 1 – The Power of Technology, in Jasanoff, S. (2016). The Ethics of Invention: Technology and the Human Future. WW Norton & Company. Available on Moodle or through Google Books
  - (While reading this, focus on the important argument near the end about intended and unintended consequences)
- Stilgoe, J. (2020) Who Killed Elaine Herzberg? Chapter one of Stilgoe, J. (2020) Who's Driving Innovation? New technologies and the collaborative state (Palgrave), reprinted here: https://onezero.medium.com/who-killed-elaine-herzberg-ea01fb14fc5e

Additional reading
- Rotolo, D., Hicks, D., & Martin, B. R. (2015). What is an emerging technology?. Research Policy, 44(10), 1827-1843.

https://www.sciencedirect.com/science/article/abs/pii/S0048733315001031
- Kranzberg, M Technology and History: "Kranzberg's Laws", Technology and Culture Vol. 27, No. 3 (Jul., 1986), pp. 544-560, http://journals.sagepub.com/doi/pdf/10.1177/027046769501500104
- Feenberg, A, 2003, What Is Philosophy of Technology? http://www.sfu.ca/~andrewf/komaba.htm
- Langdon Winner, 1977, 'Frankenstein's Problem', Ch. 8 in Autonomous Technology https://www.ratical.org/ratville/AoS/AutonomousTechnology.pdf
    - (On technology as legislation. Also read the first few pages of the book to get a feel for his argument)
- Latour, B (2012) Love Your Monsters Why We Must Care for Our Technologies As We Do Our Children, Breakthrough, Feb 14, 2012 https://thebreakthrough.org/journal/issue-2/love-your-monsters

2. The politics of technology

Do technologies have politics built into them? Can we tell in advance who is likely to benefit, what the side effects are and whether we are likely to be able to reverse course if things go wrong?

Essential reading
- David Collingridge, (1980), The Social Control of Technology, Open University Press, Chapter 1, pp. 13-21
    - (Explains the 'dilemma of control')

Recommended readings
- Latour, B writing as Johnson, J. (1988). Mixing humans and nonhumans together: The sociology of a door-closer. Social problems, 35(3), 298-310.
- Winner, L, 1980, Do Artifacts have politics, Daedalus, 109(1) pp 121-136, https://www.cc.gatech.edu/~beki/cs4001/Winner.pdf
    - (This paper is often discussed because of the bridges example. I prefer the tomato harvester example, starting on p. 126)
- Lessig, L (2000) ''Code Is Law'' 181, From Code: And Other Laws of Cyberspace (New York: Basic Books, 1999), pp. 3–8; 85–90, 241–242, 254–255. Reprinted in this online collection https://bayanbox.ir/download/9108585351007635206/eBOOK-Deborah-G.-Johnson-Jameson-M.-Wetmore-Technology-and-Society-Building-Our-Sociotechnical-Future-Inside-Technology-2008.pdf
- Genus, A., & Stirling, A. (2018). Collingridge and the dilemma of control: Towards responsible and accountable innovation. Research policy, 47(1), 61-69.
- STEPS Centre, 2010, A New Manifesto, http://anewmanifesto.org/wp-content/uploads/steps-manifesto_small-file.pdf - especially the section "A new 3D agenda"
- Dave Guston. 2008. Innovation Policy: Not Just a Jumbo Shrimp. Nature 454:940-41, http://www.nature.com/nature/journal/v454/n7207/full/454940a.html

- Stilgoe, J. (2020) Who's Driving Innovation? New technologies and the collaborative state (Palgrave), Chapters 2 and 3 ('Innovation Is Not Self-Driving' and 'The Politics of Tech')

3. Problems, solutions and technological fixes

This week, we will be looking how technologies are imagined as solutions to problems. What problems can't technology solve and what problems are caused by technological change?

Essential reading
- Dan Sarewitz and Richard Nelson, 2008, 'Three rules for technological fixes', Nature, 2008, http://thebreakthrough.org/blog/Sarewitz-Nature%20tech%20fix.pdf
  - (Asks how we can tell good fixes from bad)

Recommended reading
- Ch. 1 – Solutionism and its discontents, in Morozov, E, (2013). To Save Everything, Click Here: Technology, Solutionism, and the Urge to Fix Problems that Don't Exist. Allen Lane
  - And other pieces Morozov has written
    - https://www.theguardian.com/technology/2014/jul/20/rise-of-data-death-of-politics-evgeny-morozov-algorithmic-regulation
    - http://www.nytimes.com/2013/03/03/opinion/sunday/the-perils-of-perfection.html
    - https://slate.com/technology/2013/03/to-save-everything-click-here-how-to-vanquish-technological-defeatism.html
- Weinberg, A. M. (1966). Can technology replace social engineering?. Bulletin of the Atomic Scientists, 22(10), 4-8.
- Johnston, S. F. (2018). The Technological Fix as Social Cure-All: Origins and Implications. IEEE Technology and Society Magazine, 37(1), 47-54. https://ieeexplore.ieee.org/document/8307139
- Wetmore, J. (2007) ''Amish Technology: Reinforcing Values and Building Community'' IEEE Technology & Society Magazine 26, no. 2 (Summer 2007): 10–21. Reprinted in this online collection https://bayanbox.ir/download/910858535100763 5206/eBOOK-Deborah-G.-Johnson-Jameson-M.-Wetmore-Technology-and-Society-Building-Our-Sociotechnical-Future-Inside-Technology-2008.pdf
- Stilgoe, J. (2020) Who's Driving Innovation? New technologies and the collaborative state (Palgrave), Chapter 3 ('The Politics of Tech')

4. Technology as social experiment

This week we will be asking if the uncertainties of technology make it a form of 'social experiment'. If so, where is the laboratory and who is experimenting upon whom?

Essential reading

- van de Poel, I. (2015). An Ethical Framework for Evaluating Experimental Technology. Science and engineering ethics, 1-20. http://link.springer.com/article/10.1007/s11948-015-9724-3

Recommended reading
- Wolfgang Krohn & Peter Weingart (1987). Commentary: Nuclear power as a social experiment: European political "fall out" from the Chernobyl meltdown. Science, Technology, and Human Values, 52-58.
    - (Argues that complex technologies are experimental)
- Weinberg, A. M. (1972). Science and trans-science. Minerva, 10(2), 209-222. https://link.springer.com/content/pdf/10.1007/BF01682418.pdf
    - (Discusses questions that science is asked, but is unable to answer)
- On geoengineering…
    - Hulme, M. (2014), Can science fix climate change? A case against climate engineering, Polity Press (Preface and chapter four – 'Living in an experimental world')
- On self-driving cars…
    - Stilgoe, J (2018) Machine learning, social learning and the governance of self-driving cars, *Social Studies of Science 48, no. 1 (2018): 25-56.*

5. Risk

Technologies bring risks as well as benefits. Can we know the risks we face? How safe is safe enough? And what if we don't know how to assess the risks? How should we govern these risks and uncertainties?

Essential reading
- Ch. 2 – Risk and responsibility, in Jasanoff, S. (2016). The Ethics of Invention: Technology and the Human Future. WW Norton & Company.
- European Environment Agency, 2002, Late lessons from early warnings, Chapter 1: Introduction. http://www.eea.europa.eu/publications/environmental_issue_report_2001_22
    - (Explains the rationale for precaution)

Recommended reading
- Charles Perrow, 1981, 'Normal Accident at Three Mile Island', Society, Volume 18, Number 5, 17-26, http://www.penelopeironstone.com/Perrow.pdf
    - (Argues that accidents are inevitable and more technology can't help)
- Ch. 3 – The ethical anatomy of disasters, in Jasanoff, S. (2016). The Ethics of Invention: Technology and the Human Future. WW Norton & Company.
- Stirling, A. 2016. Precaution in the governance of technology, SPRU working paper https://www.sussex.ac.uk/webteam/gateway/file.php?name=2016-14-swps-stirling.pdf&site=25
    - (A defence of precaution)

- The debate on precaution in this post's links is also instructive.
    - https://www.theguardian.com/science/political-science/2013/jul/10/science-policy1
- Sheila Jasanoff, (2003) "Technologies of Humility: Citizen participation in governing Science,", Minerva 41:223-244, (for a quick digest of this, have a look here http://2020science.org/2008/12/24/a-manifesto-for-socially-relevant-science-and-technology/)

6. Patents, standards and platforms

Innovation is shaped in part by rules about intellectual property that guarantee monopolies to inventors (patents) and by agreements about how things should be so that they can work together (standards). New technologies are built on infrastructures and platforms that are often invisible or seen as neutral. Who decides what these infrastructures and rules should look like?

Essential reading

- Star, S. L., & Lampland, M. (2009). Reckoning with standards. In M. Lampland & S.L. Star (Eds.), Standards and their stories: How quantifying, classifying, and formalizing practices shape everyday life (pp. 3-34). https://sociology.ucsd.edu/_files/people/lampland/Star%20and%20Lampland%20Reckoning%20Introduction%20to%20Standards%20and%20their%20Stories.pdf

Recommended reading

- Ch. 7 – Whose knowledge, whose property?, in Jasanoff, S. (2016). The Ethics of Invention: Technology and the Human Future. WW Norton & Company.
- Introduction, in Parthasarathy, P. (2017), Patent Politics, Life Forms, Markets, and the Public Interest in the United States, University of Chicago Press (available on Moodle)
- Vaidhyanathan, S (2017), Intellectual Property: A Very Short Introduction, OUP
- Gillespie, T. (2018). Platforms are not intermediaries. Georgetown Law Technology Review, 2(2), 198-216.
- Introduction, in Busch, L. (2011) Standards: Recipes for Reality, MIT Press http://ieeexplore.ieee.org/xpl/bkabstractplus.jsp?bkn=6517054 (accessible with UCL ID – read "Front Matter")

7. Expectations and hype

Science and innovation are forward-looking, and the future is unknown and profoundly uncertain. When scientists and innovators talk about the future they are therefore making political claims. We need to think about how to hold these claims to account.

Essential reading

- Borup, M., Brown, N., Konrad, K., & Van Lente, H. (2006). The sociology of expectations in science and technology. Technology analysis & strategic management,

18(3-4), 285-298.
http://www.tandfonline.com/doi/abs/10.1080/09537320600777002

Recommended reading

- Rayner, S. (2004). The novelty trap: why does institutional learning about new technologies seem so difficult? Industry and Higher Education, 18(6), 349-355. (UCL seems not to have this, so I've uploaded a version on Moodle)
    - o (Explains how technology is often sold as 'new', until the regulators come knocking).
- Jasanoff, S. (2015) Future imperfect. Chapter one in Dreamscapes of Modernity, version available here http://iglp.law.harvard.edu/wp-content/uploads/2014/10/Jasanoff-Ch-1.pdf
- Selin C (2008). The sociology of the future: tracing stories of technology and time. Sociology Compass, 2(6):1878–1895. http://orbit.dtu.dk/fedora/objects/orbit:133279/datastreams/file_95653ce2-1c3c-49f8-8ec6-772730842b06/content
- Nathaniel Comfort, 2016. Why the hype around medical genetics is a public enemy, Aeon, https://aeon.co/ideas/why-the-hype-around-medical-genetics-is-a-public-enemy
- David Karpf, 2018. 25 years of Wired predictions: Why the future never arrives, Wired magazine, 18 Sept 2018, https://www.wired.com/story/wired25-david-karpf-issues-tech-predictions/
- Stilgoe, J. (2020) Who's Driving Innovation? New technologies and the collaborative state (Palgrave), Chapter 4 ('In Dreams Begins Responsibility')

8. Science, technology and inequality

Technologies are often justified on the grounds that they will disrupt existing power structures and offer benefits to people who are poor or marginalised. Is this true?

Essential reading

- Andrew Russell and Lee Vinsel, 2017, Whitey on Mars, Aeon, https://aeon.co/essays/is-a-mission-to-mars-morally-defensible-given-todays-real-needs
    - o (Argues against "trickle-down innovation")
- Woodhouse, E., and D. Sarewitz. 2007. Science policies for reducing societal inequities, Science and Public Policy 34 (2): 139–150.
    - o (Discusses whether technology makes inequality worse and what policies might improve things)

Recommended reading

- Richard Nelson. 2011. The Moon and the Ghetto revisited, Science and Public Policy, 38(9), November 2011, pages 681–690
    - o (Asks why rich societies can put men on the moon but not look after their

poorest people)
- Stilgoe, J. (2020) Who's Driving Innovation? New technologies and the collaborative state (Palgrave), Chapter 3 ('The Politics of Tech')
- Costanza-Chock, S. (2018). Design Justice, A.I., and Escape from the Matrix of Domination. Journal of Design and Science.
https://jods.mitpress.mit.edu/pub/costanza-chock/release/4

- <u>On AI, algorithms and data</u>
  - ProPublica (2016) Machine Bias, There's software used across the country to predict future criminals. And it's biased against blacks.
  https://www.propublica.org/article/machine-bias-risk-assessments-in-criminal-sentencing
  - Eubanks, V. (2018). Automating inequality: How high-tech tools profile, police, and punish the poor. St. Martin's Press.
  - Alexandra Mateescu Madeleine Clare Elish (2019) AI in Context: The Labor of Integrating New Technologies, Data and Society report,
  https://datasociety.net/wp-content/uploads/2019/01/DataandSociety_AIinContext.pdf
  - Irani, L. (2015, January 15, 2015). Justice for "data janitors". Public Books.
  http://www.publicbooks.org/nonfiction/justice-for-data-janitors
  - Crawford and Paglen, The Politics of Images in Machine Learning Training Sets https://www.excavating.ai/

9. Responsibility and Frankenstein

If science and technology are powerful forces, where is the responsibility that should come with this power?

Essential reading
- Douglas, H. E. (2003). The moral responsibilities of scientists (tensions between autonomy and responsibility). American Philosophical Quarterly, 59-68.
http://www.jstor.org/discover/10.2307/20010097?uid=2129&uid=2&uid=70&uid=4&sid=21101531219477
  - (Asks what we should expect scientists to take responsibility for)

Recommended reading
- Stilgoe, J, Owen, R and Macnaghten, P, (2013), Developing a framework for responsible innovation, Research Policy (open access)
http://www.sciencedirect.com/science/article/pii/S0048733313000930
  - (just look at the first bit, which provides background to new approaches to responsible innovation)
- Walter D. Valdivia and David H. Guston (2015) Responsible innovation: A primer for policymakers, Brookings institution, May 2015
http://www.brookings.edu/~/media/research/files/papers/2015/05/05-responsible-

innovation-valdivia-guston/valdivia-guston_responsible-innovation_v9.pdf
  o (A US and policy-focussed take on responsible innovation)
• Langdon Winner, 1977, 'Frankenstein's Problem', Ch. 8 in Autonomous Technology
https://www.ratical.org/ratville/AoS/AutonomousTechnology.pdf
  o (Also read the first few pages of the book to get a feel for his argument)
• Latour, B (2012) Love Your Monsters Why We Must Care for Our Technologies As We Do Our Children, Breakthrough, Feb 14, 2012
https://thebreakthrough.org/journal/issue-2/love-your-monsters

• On Asilomar
  o Michael Rogers, 1975, The Pandora's Box Congress, Rolling Stone magazine, June 19th 1975
    http://web.mit.edu/endy/www/readings/RollingStone(189)37.pdf
  o Dorothy Nelkin. 2001. Beyond risk: reporting about genetics in the post-Asilomar press. Perspectives in Biology and Medicine
    https://muse.jhu.edu/journals/perspectives_in_biology_and_medicine/v044/44.2nelkin.pdf
  o Hurlbut, J. B. (2015). Limits of responsibility: genome editing, Asilomar, and the politics of deliberation. Hastings Center Report, 45(5), 11-14.

10. tbc
This week is kept open to respond to events or students' priorities and interests

Course expectations

In addition to submitting assessed material, students are expected to watch all lectures, join all seminar discussions and critically read all essential readings. They are expected to be able to discuss the essential reading each week and be willing to discuss the lecture content. Students are expected to conduct online research into areas of new technology. Students are also expected to publish blog posts online so that other members of the class can read them.

Important policy information

Details of college and departmental policies relating to modules and assessments can be found in the STS Student Handbook www.ucl.ac.uk/sts/handbook

All students taking modules in the STS department are expected to read these policies.