HPSC0061 Governing Emerging Technologies

Course Syllabus

2019-20 session | Dr Jack Stilgoe | j.stilgoe@ucl.ac.uk

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 their implications, prevent hazards and share their benefits? As science introduces new risks and ethical dilemmas, what should governments do to control research, publication, patenting and innovation? The course teaches students to think and write clearly and critically about technology. It will discuss case studies including self-driving cars, geoengineering and genetic engineering. It is assessed through an essay and a pair of blog posts.

Basic course information

Course website:	http://www.ucl.ac.uk/sts/staff/stilgoe/
Moodle Web site:	HPSC0061
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. Course is designed for 3rd year students
Required texts:	No required texts for the course overall, but particular readings are required for each week's seminar
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:	Tuesdays 11:30-1:30pm

Schedule

UCL Week	Topic	Lecture Date	Activity
6	**The politics of "tech"**	3 Oct	Do essential reading before each seminar
7	**Problems, solutions and technological fixes**	10 Oct	
8	**Technology as a social experiment**	17 Oct	
9	**Risk, uncertainty and precaution**	24 Oct	Blog post one due 23 Oct
10	**Expectations and hype**	31 Oct	
12	**Reading Week**		
11	**Who benefits from AI and big data?**	14 Nov	
13	**Patents and standards**	21 Nov	
14	**Science, technology and inequality**	28 Nov	Both blog posts due 27 Nov
15	**Secrets of Silicon Valley (Guest: Jamie Bartlett)**	5 Dec	
16	**Responsible innovation**	12 Dec	(no tutorials this week)
			Essay due 13 Jan

Assessments

	Description	Deadline	Word limit
Blog posts	Draft blog post one (submitted via email) Blog posts one and two (submitted via Moodle)	5 pm, 23 Oct 5 pm, 27 Nov	Total 2,500
Essay	See titles below	5pm, 13 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 can we govern new technologies?
2. If we see technology as a social experiment, how could this change its regulation? Discuss using examples
3. What can the history of the motor car tell us about the governance of self-driving cars?
4. What might a responsible innovation approach to genome editing in human beings consist of?
5. Could self-driving cars solve the problem of road safety?
6. How does the sociology of expectations change our view of new technologies?
7. How might we govern the development of artificial intelligence so that the technology reduces rather than exacerbates inequality?

(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 here: https://bayanbox.ir/download/9108585351007635206/eBOOK-Deborah-G.-Johnson-Jameson-M.-Wetmore-Technology-and-Society-Building-Our-Sociotechnical-Future-Inside-Technology-2008.pdf

1. **The politics of 'tech'**

The first lecture will introduce the course's key questions, case studies and approach. In the seminars, we will discuss the Jasanoff reading and share initial ideas for blog posts. Come prepared!

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)
- For the first seminar, everyone must also come with one article, blog post, case study or issue that is relevant to the course and be prepared to discuss it.

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

2. Problems, solutions and technological fixes

This week, we will be looking at the problems that technology can and can't solve and the problems caused by technological change.

Essential reading

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

Additional 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
- 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
- Genus, A., & Stirling, A. (2018). Collingridge and the dilemma of control: Towards responsible and accountable innovation. Research policy, 47(1), 61-69.

3. 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 doing the experimenting? In the seminars, we will discuss what makes for a good blog post.

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…
    - Mike Hulme, 2014, Can science fix climate change? A case against climate engineering, Polity Press (Preface and chapter four – 'Living in an experimental world') (on Moodle)
        - (What is says on the tin – a case against climate engineering)
- 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.*

4. Risk, accidents and precaution

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

5. **Who benefits from AI and big data?**

Artificial intelligence seems to be the next Next Big Thing. As AI is becoming a part of our lives, concerns are emerging that it might create or reinforce biases. How should we think about the politics of digital technologies (algorithms, big data, machine learning and other AI), which can emerge rapidly and without thought for their consequences? In the seminars, we will be discussing an important piece of investigative journalism that highlighted the injustices of one algorithmic tool.

Essential reading

- 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

Recommended reading

- Eubanks, V. (2018). Automating inequality: How high-tech tools profile, police, and punish the poor. St. Martin's Press. (This is the STS Department OneBook for 2019-20)
- Halevy, A., Norvig, P., & Pereira, F. (2009). The unreasonable effectiveness of data. IEEE Intelligent Systems, 24(2), 8-12. https://static.googleusercontent.com/media/research.google.com/en//pubs/archive/35179.pdf
- 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
- Crawford and Paglen, The Politics of Images in Machine Learning Training Sets https://www.excavating.ai/

Watch

- A lecture from Kate Crawford at the Royal Society in 2018, You and AI – the politics of AI, https://www.youtube.com/watch?v=HPopJb5aDyA

Listen

- Deepmind podcast, episode 6, on AI ethics https://deepmind.com/blog/article/podcast-episode-6-AI-for-everyone

6. Patents and standards

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). Our world is made up of standardised and patented technologies. Who decides what these rules should be?

Essential reading

- 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")

Recommended reading

- 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)
- Ch. 7 – Whose knowledge, whose property?, in Jasanoff, S. (2016). The Ethics of Invention: Technology and the Human Future. WW Norton & Company.

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)
    - (Explains how technology is often sold as 'new', until the regulators come knocking).
- 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/

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
    - (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.
    - (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
    - (Asks why rich societies can put men on the moon but not look after their poorest people)
- Melissa Leach and Ian Scoones, 2007, The Slow Race: Making technology work for the poor, London, Demos, http://www.demos.co.uk/files/The%20Slow%20Race.pdf
- Smallman M (2015) Can science be the solution if it is part of the problem? Guardian Political Science Blog. https://www.theguardian.com/science/political-science/2015/feb/09/can-science-be-the-solution-if-it-is-part-of-the-problem

9. Secrets of Silicon Valley

For the penultimate class, we are lucky to have Jamie Bartlett, one of the UK's leading technology analysts and writers. Watch his film before he comes in and we will discuss it with him during the lecture.

Essential watching

- Secrets of Silicon Valley. Episode 1 – The Disruptors (This programme will probably not be available on BBC iPlayer, so I will make sure a version is available).

Recommended reading

- Bartlett, J. 2018. The people vs Tech. Penguin
    - (If you can't get a copy, flick through here https://books.google.co.uk/books?id=lQI_DwAAQBAJ&printsec=frontcover&source=gbs_ge_summary_r&cad=0#v=onepage&q&f=false)
- Bartlett, J. 2017. Radicals: Outsiders changing the world. Heinemann
- … and Assorted shorter pieces by Jamie
    - http://mashable.com/2017/08/06/silicon-valley-automation-apocalypse-jamie-bartlett/#IJr4IZeVMsqU
    - https://www.spectator.co.uk/2017/08/silicon-valleys-wealthy-elite-have-made-social-inequality-worse/
    - https://www.theguardian.com/world/2017/aug/31/far-right-alt-right-white-supremacists-rise-online
    - http://foreignpolicy.com/2017/09/01/the-green-radicals-are-coming-environmental-extremism/

Also…

- Jamie's NEW podcast, The Missing Cryptoqueen, BBC Sounds, 2019, https://www.bbc.co.uk/programmes/p07nklnm

10. Responsible innovation

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

- (A US and policy-focussed take on responsible innovation)

Course expectations

In addition to submitting assessed material, students are expected to attend all lectures and seminars. They are expected to have read the essential reading before each seminar and be willing to discuss the readings and the lecture. 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.