HPSC0061/HPSC0092 Emerging Technologies and responsible innovation

Course Syllabus

2023-2024 session | Jack Stilgoe | j.stilgoe@ucl.ac.uk

Course description

Science and technology are increasingly important and powerful. With this power should come responsibility, but this is often not what happens. This course goes inside technology to discuss its political and ethical dimensions. Are technologies inevitable, or can we control the technologies that we get, anticipate the implications, prevent hazards and share the benefits? Is innovation a form of '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 AI, self-driving cars, geoengineering, genetic engineering and music technologies. We will use ideas from the sociology of science, philosophy of technology and science policy studies. The assessment is a trio of blog posts.

Basic course information

Moodle Web site:	HPSC0061 (3rd year undergraduate) or HPSC0092 (MSc)
Assessment:	3 x Blog posts (1,000 words each)
Timetable:	https://timetable.ucl.ac.uk/tt/homePage.do
Prerequisites:	No pre-requisites Do not take HPSC0092 if you have already taken HPSC0061
Required texts:	No required texts for the course overall, but particular readings are required for each week
Course tutors:	Course leader: Professor Jack Stilgoe Teaching assistants: Jaspreet Crowson and Lucy Maun
Contact:	j.stilgoe@ucl.ac.uk
Office location:	Jack: 22 Gordon Square, Room 3.3
Office hours:	Jack: Thursdays, 4-5pm (on MS Teams); Fridays, 11--12am (in person, in the office) Jaspreet: TBC Lucy: TBC

Schedule

Week beginning	Topic	Essential reading	Moodle Forum activity
2 Oct	'Tech'	Jasanoff	Introduce yourself
9 Oct	The politics of technology	Collingridge	Find and share a blog post
16 Oct	Problems, solutions and technological fixes	Sarewitz and Nelson; Weinberg	What's your idea for a blog post?
23 Oct	Technology as a social experiment	Van de Poel	
30 Oct	Risk	Hurlbut	Submit your first blog post, due 30 Oct
6 Nov	Reading Week		
13 Nov	Expectations and hype	Borup et al	Comment on other students' posts
20 Nov	Standards and platforms	Star and Lampland	Submit your second blog post due 20 Nov
27 Nov	Inequality	Russel and Vinsel; Woodhouse and	Comment on other students' posts
4 Dec	Responsibility	Hurlbut	What's your idea for a final blog post?
11 Dec	Automation and music		

Assessments

	Description	Deadline	Word limit
Draft Blog posts	Draft blog post one (submitted to the Moodle forum) Draft blog post two (submitted to the Moodle forum)	12 pm, 30 Oct 12 pm, 20 Nov	1,000 words each
Three final blog posts	Final submission (uploaded via Turnitin)	5pm, 10 Jan	3,000 total

Assignments

To be deemed 'complete' on this module, students must submit the blog posts.

The final blog posts must be submitted via Moodle. Blog posts should also be published online, where they can be viewed and commented upon by others. 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 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 course tutors.

To maximise the time for discussion in seminars, we will do most of the workshopping of blog posts online, using a Moodle forum. Students will propose blog topics early in the term to get feedback and post a draft of their first post to be read by other students.

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. The course also asks students to write accessibly and publicly, via a blog, about new technologies.

Reading list

Essential readings are 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 some of the **recommended** pieces. It is also expected that you will explore additional material to inform your blogs and class discussions.

Additional readings, videos and podcast recommendations will be put on Moodle. Students will be expected to research and engage with issues and debates about technology, so wider reading, listening etc is vital.

Podcast recommendations

Try these recent episodes and others from these series (a longer list is on Moodle)

- Blood in the machine, 99% Invisible, Sept 2023 https://99percentinvisible.org/episode/blood-in-the-machine/
- Are You Ready For A.I. Generated Actors? What Next: TBD, June 2023 https://podcasts.apple.com/us/podcast/are-you-ready-for-a-i-generated-actors/id1302281912?i=1000616473560
- The Long, Hot AI Summer, India's Space Mission, and Addressing Inequality through Innovation, The Received Wisdom, Sept 2023 https://podcasts.apple.com/us/podcast/episode-35-the-long-hot-ai-summer-indias-space/id1476334065?i=1000627784356

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 see Stilgoe, J (2020) Who's Driving Innovation? New technologies and the collaborative state (Palgrave). Available online through UCL library or here https://link.springer.com/book/10.1007%2F978-3-030-32320-2

1. 'Tech'

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

In the seminar, we will discuss our individual relationships with technology and what these can tell us about technology-in-society.

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
    - The book is available online here: https://link.springer.com/book/10.1007%2F978-3-030-32320-2

Recommended 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?

In the seminar, we will discuss the Collingridge dilemma.

Online, we will start discussing blog post topics.

Essential reading

- David Collingridge, (1980), The Social Control of Technology, Open University Press, Chapter 1, pp. 13-21
    - (Explains the 'dilemma of control'. Pay attention to all of the examples used.)

Recommended reading

- 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. But the tomato harvester example is better, 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. https://www.sciencedirect.com/science/article/pii/S0048733317301622
- 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?

In the seminar, we will talk about the relationships between social problems and technological fixes.

Essential reading

- Dan Sarewitz and Richard Nelson, 2008, 'Three rules for technological fixes', Nature, 2008, https://www.nature.com/articles/456871a (Asks how we can tell good fixes from bad)
- Weinberg, A. M. (1966). Can technology replace social engineering?. Bulletin of the Atomic Scientists, 22(10), 4-8. https://bentleyhcsfa15.files.wordpress.com/2015/04/weinberg-can-technology-replace-social-engineering.pdf

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
- 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/9108585351007635206/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 a 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?

In the seminar, we will probably focus on gene drives as a case study of a social experiment. Find out about gene drives in advance.

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)
- 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/)

- 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. Technologies bring risks as well as benefits. But which risks are most important? Can we know the risks we face? How should we govern these risks and uncertainties?

In the seminar, we will concentrate on the 1975 Asilomar meeting and ask whether it provides a good model for risk governance.

Essential reading

- Hurlbut, J. B. (2015). Limits of responsibility: genome editing, Asilomar, and the politics of deliberation. Hastings Center Report, 45(5), 11-14. https://doi.org/10.1002/hast.484

Recommended reading

- Jasanoff, S. (1995) ‘Product, process, or programme: three cultures and the regulation of biotechnology’, in M. Bauer (ed.), Resistance to New Technology, pp. 311–31, Cambridge University Press. http://sheilajasanoff.stsprogram.org/wp-content/uploads/39-Product-Process-or-Programme.pdf
- Ch. 2 – Risk and responsibility, in Jasanoff, S. (2016). The Ethics of Invention: Technology and the Human Future. WW Norton & Company.
- Jasanoff, S (2016) Ch. 3 – The ethical anatomy of disasters, in Jasanoff, S. (2016). The Ethics of Invention: Technology and the Human Future. WW Norton & Company.
- 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)
- 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)
  - The debate on precaution in this post's links is also helpful https://www.theguardian.com/science/political-science/2013/jul/10/science-policy1
- On Asilomar
  - 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
  - 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
    - (an analysis of Asilomar in its historical and policy context)

6. 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.

In the seminar, we will consider the hype around self-driving cars and ask whether it is a good thing.

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. https://journals.sagepub.com/doi/10.5367/0000000042683601
  - (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. https://onlinelibrary.wiley.com/doi/abs/10.1111/j.1751-9020.2008.00147.x
- 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

- Campolo, A., & Crawford, K. (2020). Enchanted determinism: Power without responsibility in artificial intelligence. Engaging Science, Technology, and Society, 6, 1-19. https://estsjournal.org/index.php/ests/article/view/277
- Milne, G (2020) Smoke and Mirrors (Robinson), Introduction
- Stilgoe, J. (2020) Who's Driving Innovation? New technologies and the collaborative state (Palgrave), Chapter 4 ('In Dreams Begins Responsibility')

7. **Standards and platforms**

New technologies are built on infrastructures, platforms and standards that are often invisible or seen as neutral. Who decides what these infrastructures and rules should look like?

In the seminar, we will hunt for and discuss the hidden rules that shape our technological lives.

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

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

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?

In the seminar, we will ask whether science and innovation widen or narrow the gap between powerful and marginalized groups.

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

- Stilgoe, J. (2020) Who's Driving Innovation? New technologies and the collaborative state (Palgrave), Chapter 3 ('The Politics of Tech')
- Parthasarathy, P (2023) Can Innovation Serve the Public Good?, Boston Review https://www.bostonreview.net/articles/can-innovation-serve-the-public-good/
- On AI, algorithms and data
    - Campolo, A., & Crawford, K. (2020). Enchanted determinism: Power without responsibility in artificial intelligence. Engaging Science, Technology, and Society, 6, 1-19. https://estsjournal.org/index.php/ests/article/view/277
        - And, for a longer discussion, Crawford, K (2021) The Atlas of AI, Yale university press
    - Benjamin, R (2019) Assessing risk, automating racism, Science, Vol 366, Issue 6464 pp. 421-422 https://www.science.org/doi/full/10.1126/science.aaz3873
        - Refers to a few key books, by Benjamin, Eubanks, Nelson and Noble
    - Eubanks, V. (2018). Automating inequality: How high-tech tools profile, police, and punish the poor. St. Martin's Press.
    - Irani, L. (2015). Justice for "data janitors". Public Books. http://www.publicbooks.org/nonfiction/justice-for-data-janitors
    - Doctorow, C, (2020) How to destroy Surveillance Capitalism https://onezero.medium.com/how-to-destroy-surveillance-capitalism-8135e6744d59
    - Shew, A. (2020). Ableism, technoableism, and future AI. IEEE Technology and Society Magazine, 39(1), 40-85. https://ieeexplore.ieee.org/document/9035527

9. Responsibility

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

In the seminar, we will look at gene editing and ask whether scientists' own models of responsibility are an adequate response.

Essential reading

- Hurlbut, B (2020). Imperatives of governance: human genome editing and the problem of progress. Perspectives in biology and medicine, 63(1), 177-194 https://muse.jhu.edu/article/748059
    - (Hurlbut was a witness to the He Jiankui episode)
    - Hurlbut is on this episode of The Received Wisdom podcast https://shobitap.org/the-received-wisdom/2020/9/17/episode-10-envisioning-a-just-future-with-or-without-crispr-ft-ben-hurlbut
    - And there is a film (unavailable in the UK) and podcast series devoted to this

episode https://makepeoplebetterfilm.com/

Recommended 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)
- 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)
- Langdon Winner, 1977, 'Frankenstein's Problem', Ch. 8 in Autonomous Technology https://www.ratical.org/ratville/AoS/AutonomousTechnology.pdf
    - (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
- Kirksey, E (2020) The mutant project, Bristol University Press
    - An insider's account of the He Jiankui controversy
    - See his lecture here https://www.youtube.com/watch?v=YG4jBt0kgL4

10. Automation and music

The final week asks how the use of new technologies change musical outputs, musical taste, and musical labour.

No seminars this week, as it's the last one of term. Instead, we will be doing last-minute drop-ins where students can discuss their plans for final blog posts.

Essential Reading

- Stilgoe, J, (2023), Give the Drummer Some, Aeon Magazine https://aeon.co/essays/what-drum-machines-can-teach-us-about-artificial-intelligence

Additional Reading

- Provenzano, C (2018) Auto-Tune, Labor, and the Pop-Music Voice, in The Relentless Pursuit of Tone: Timbre in Popular Music, Robert Fink (ed.) et al. https://academic.oup.com/book/10894/chapter-abstract/159137912
- Pinch, T. J., & Bijsterveld, K. (2003). " Should one applaud?": Breaches and boundaries in the reception of new technology in music. Technology and Culture, 44(3), 536-559.
- Iverson Jennifer (2021) TR–808: Race, Groove, and Drum Machines,

https://music.uchicago.edu/news/jennifer-iverson-tr-808-race-groove-and-drum-machines

- Frey, C. B., & Osborne, M. A. (2017). The future of employment: How susceptible are jobs to computerisation?. Technological forecasting and social change, 114, 254-280. https://www.sciencedirect.com/science/article/abs/pii/S0040162516302244
    - (a simplistic, problematic but highly influential account of possible technological unemployment)

Course expectations

In addition to submitting assessed material, students are expected to attend 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.