

Massachusetts Institute of Technology
Program in Science, Technology, and Society
Fall 2026

STS.410 — Technology and Capital

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Thursdays 2:30-5:30 · E51-165
Format: Seminar, 3-0-9 (12 units) · Level: Graduate · Prerequisites: None

Course Description

Examines the mutual constitution of technology and capital. The seminar draws on Marx and the Marxian traditions — labor process theory, Italian workerism, social reproduction theory, the Black radical tradition, ecological Marxism — alongside and against science and technology studies, to ask how capitalist social relations shape technological development, and how technological systems in turn organize accumulation, control, and value extraction. Topics include machinery and the labor process; the Marxist historiography of science; automation and its ideologies; social reproduction and the gendering of technological work; racial capitalism and the informatics of value; fossil energy, extraction, and uneven development; logistics, platforms, and the digital factory; and the prospect of a socialist technology. Readings from Marx, Panzieri, Braverman, Noble, Federici, Robinson, Haraway, and Malm, among others, with sustained attention to perspectives from the global south.

A Note on Editions

We will read *Capital*, Volume 1 in the new translation by Paul Reitter (ed. Paul North; Princeton University Press, 2024), which follows the chapter divisions of the German edition; Penguin (Fowkes) chapter numbers are given in brackets throughout for those using that edition. Volume 3 and the *Grundrisse* are cited from the Penguin editions.

A Note on Readings

A short headnote frames the question each week asks. Suggested further readings are optional: points of departure for reading responses and seminar papers. All required readings will be available on the course site.

Assessment

Seminar participation: 25%

Weekly reading responses (1 page, any 8 of 13 weeks): 25%

Final seminar paper (20-25 pages): 50%

Schedule of Readings

Part I: Marx's Machine

Week 1: Reading Capital for Technology — Value, Fetishism, and the Labor Process

Was Marx a technological determinist? The opening debate poses the question the rest of the semester dismantles. We begin not with machines but with the commodity and the value-form: fetishism and the distinction between labor process and valorization process are the conceptual tools on which Weeks 3, 9, 10, and 13 depend.

Marx, Karl. *Capital: Critique of Political Economy, Volume 1*. Translated by Paul Reitter. Princeton: Princeton University Press, 2024. Ch. 1, "The Commodity," and ch. 5, "Labor Process and Valorization Process" [Penguin chs. 1, 7].

Rosenberg, Nathan. "Marx as a Student of Technology." *Monthly Review* 28, no. 3 (1976): 56-77.

Shaw, William H. "'The Handmill Gives You the Feudal Lord': Marx's Technological Determinism." *History and Theory* 18, no. 2 (1979): 155-176.

Bimber, Bruce. "Karl Marx and the Three Faces of Technological Determinism." *Social Studies of Science* 20, no. 2 (1990): 333-351.

Suggested further reading:

Wendling, Amy E. *Karl Marx on Technology and Alienation*, chs. 1-3. New York: Palgrave Macmillan, 2009.

Harvey, David. *A Companion to Marx's Capital*, chs. 1-2, 7. London: Verso, 2010.

Week 2: Machinery and Large-Scale Industry

Panzieri's thesis, read from inside the machinery chapter, is the claim the whole course tests: capitalist despotism does not distort an otherwise neutral technology — it takes the form of technological rationality itself. The despotism is in the design.

Marx, Karl. *Capital*, Vol. 1, chs. 10-13: "The Concept of Relative Surplus Value," "Cooperation," "The Division of Labor and Manufacture," "Machinery and Large-Scale Industry" [Penguin chs. 12-15].

Panzieri, Raniero. "The Capitalist Use of Machinery: Marx versus the Objectivists" (1961). In *Outlines of a Critique of Technology*, edited by Phil Slater, 44-68. London: Ink Links, 1980.

MacKenzie, Donald. "Marx and the Machine." *Technology and Culture* 25, no. 3 (1984): 473-503.

Suggested further reading:

Wendling, Amy E. *Karl Marx on Technology and Alienation*, chs. 4-5.

Wright, Steve. *Storming Heaven: Class Composition and Struggle in Italian Autonomist Marxism*, chs. 1-3. London: Pluto Press, 2002.

Marx, Karl. "Results of the Immediate Process of Production" (on formal and real subsumption). Appendix to the Penguin *Capital*, Vol. 1, 1019–1038.

Week 3: Accumulation, Crisis, and the General Intellect

Two arguments about capital undermining its own value basis, read side by side: the falling rate of profit and the Fragment's general intellect. Postone's treadmill — productivity gains that reconstitute the very compulsion they promised to relieve — returns in Week 13 as the discipline on automation hype.

Marx, Karl. *Capital*, Vol. 1, ch. 23, "The General Law of Capitalist Accumulation," sections 1–4 [Penguin ch. 25].

Marx, Karl. *Capital*, Vol. 3, chs. 13–15: "The Law of the Tendency of the Rate of Profit to Fall," "Counteracting Influences," "Internal Contradictions of the Law." London: Penguin, 1981.

Marx, Karl. "Fragment on Machines." In *Grundrisse*, translated by Martin Nicolaus, 690–712. London: Penguin, 1973.

Postone, Moishe. *Time, Labor, and Social Domination*, ch. 8 selection ("Abstract Time and the Dialectic of Transformation and Reconstitution," 286–306). Cambridge: Cambridge University Press, 1993.

Suggested further reading:

Postone, Moishe. *Time, Labor, and Social Domination*, chs. 1 and 9.

Mau, Søren. *Mute Compulsion: A Marxist Theory of the Economic Power of Capital*, Part III. London: Verso, 2023.

Harvey, David. *A Companion to Marx's Capital*, chs. on accumulation.

Part II: The Marxist Historiography of Science

Week 4: The 1931 Moment

Hessen and Grossmann conceptualize science as one kind of labor within the system of social production: economic demands pose technical problems — transport, mining, ballistics — and the technical problems generate the physics. Schaffer and Graham complicate the argument's politics without dissolving its force.

Hessen, Boris. "The Social and Economic Roots of Newton's Principia" (1931), and Grossmann, Henryk. "The Social Foundations of Mechanistic Philosophy and Manufacture" (1935). In *The Social and Economic Roots of the Scientific Revolution: Texts by Boris Hessen and Henryk Grossmann*, edited by Gideon Freudenthal and Peter McLaughlin, including the editors' introduction. Dordrecht: Springer, 2009.

Zilsel, Edgar. "The Sociological Roots of Science." *American Journal of Sociology* 47, no. 4 (1942): 544–562.

Schaffer, Simon. "Newton at the Crossroads." *Radical Philosophy* 37 (1984): 23–28.

Graham, Loren R. "The Socio-Political Roots of Boris Hessen: Soviet Marxism and the History of Science." *Social Studies of Science* 15, no. 4 (1985): 705–722.

Suggested further reading:

- Hall, A. Rupert. Review of *Science at the Cross Roads*. *British Journal for the Philosophy of Science* 26, no. 3 (1975): 265–267.
- Ravetz, Jerome, and Richard S. Westfall. “Marxism and the History of Science.” *Isis* 72, no. 3 (1981): 393–405.
- Vucinich, Alexander. “Soviet Marxism and the History of Science.” *Russian Review* 41, no. 2 (1982): 123–143.
- Winkler, Sean. *Boris Hessen and Philosophy: The Socioeconomic Roots of Classical and Modern Physics*. Lanham: Rowman & Littlefield, 2024.

Week 5: Red Science — The Radical Science Movement, from the Visible College to Lysenko

Werskey’s essay periodizes the Marxist critique of capitalist science in three movements; the Roses’ manifesto is the second movement speaking in its own voice. Lysenkoism is the acid test every account of “socialist science” must pass, and Levins and Lewontin — who face it directly — are also the tradition’s living research program: a dialectical biology.

- Werskey, Gary. “The Marxist Critique of Capitalist Science: A History in Three Movements?” *Science as Culture* 16, no. 4 (2007): 397–461.
- Rose, Hilary, and Steven Rose, eds. *The Radicalisation of Science: Ideology off/in the Natural Sciences*. London: Macmillan, 1976. Introduction and ch. 1, “The Radicalisation of Science” (1972).
- Lewontin, Richard, and Richard Levins. “The Problem of Lysenkoism.” In Rose and Rose, eds., *The Radicalisation of Science*, ch. 2.
- Levins, Richard, and Richard Lewontin. *The Dialectical Biologist*, Introduction, “The Organism as Subject and Object of Evolution,” and “Conclusion: Dialectics.” Cambridge, MA: Harvard University Press, 1985.

Suggested further reading:

- Werskey, Gary. *The Visible College: The Collective Biography of British Scientific Socialists of the 1930s*, chapters on Bernal, Haldane, and Needham. London: Allen Lane, 1978.
- Rose, Hilary, and Steven Rose, eds. *The Political Economy of Science: Ideology off/in the Natural Sciences* (companion volume). London: Macmillan, 1976 — especially Gorz, “On the Class Character of Science and Scientists,” and Cooley, “Contradictions of Science and Technology in the Productive Process” (a draughtsman’s-eye anticipation of Week 6).
- Sheehan, Helena. *Marxism and the Philosophy of Science: A Critical History*, Introduction and chs. 1–4. London: Verso, 2018 [1985].
- Sheehan, Helena. “Marxism and Science Studies: A Sweep through the Decades.” *International Studies in the Philosophy of Science* 21, no. 2 (2007): 197–210.
- Young, Robert M. “Marxism and the History of Science.” In *Companion to the History of Modern Science*. London: Routledge, 1989.
- Nieto-Galán, Agustí. “Antonio Gramsci Revisited: Historians of Science, Intellectuals, and the Struggle for Hegemony.” *History of Science* 49, no. 4 (2011): 453–478.

McGucken, William. *Scientists, Society, and State: The Social Relations of Science Movement in Great Britain, 1931-1947*. Columbus: Ohio State University Press, 1984.

Foster, John Bellamy. *The Return of Nature: Socialism and Ecology*, chs. on Bernal and Haldane. New York: Monthly Review Press, 2020.

Part III: Labor, Automation, Rationality

Week 6: The Degradation of Work — Braverman and the Labor Process Debate

Braverman's core claim: to secure control and cheapen labor, conception and execution must be rendered separate spheres of work. Burawoy answers from inside the factory — consent is manufactured on the shop floor, not merely coerced — making this the week the labor process debate actually happens, and the week ethnography becomes an instrument of theory.

Braverman, Harry. *Labor and Monopoly Capital: The Degradation of Work in the Twentieth Century*, chs. 1, 3-5, and 9. New York: Monthly Review Press, 1974.

Adler, Paul S. "Marx, Machines, and Skill." *Technology and Culture* 31, no. 4 (1990): 780-812.

Burawoy, Michael. *Manufacturing Consent: Changes in the Labor Process under Monopoly Capitalism*, chs. 1-2. Chicago: University of Chicago Press, 1979.

Suggested further reading:

Braverman, *Labor and Monopoly Capital*, chs. 15 and 20.

Thompson, Paul. *The Nature of Work: An Introduction to Debates on the Labour Process*. London: Macmillan, 1983.

Knights, David, and Hugh Willmott, eds. *Labour Process Theory*. London: Macmillan, 1990.

Week 7: Automation as Politics and Ideology

Noble's record-playback story shows that people, not destiny, chose the technology; Resnikoff shows "automation" was from birth a term of ideology that recast speed-up as neutral technical progress. Train the ear here: in Week 13 the same word returns spelled "AI."

Noble, David F. *Forces of Production: A Social History of Industrial Automation*, chs. 1 and 7-11. New York: Knopf, 1984.

Resnikoff, Jason. *Labor's End: How the Promise of Automation Degraded Work*, Introduction and ch. 1. Urbana: University of Illinois Press, 2021.

Schaffer, Simon. "Babbage's Intelligence: Calculating Engines and the Factory System." *Critical Inquiry* 21, no. 1 (1994): 203-227.

Winner, Langdon. "Do Artifacts Have Politics?" *Daedalus* 109, no. 1 (1980): 121-136.

Suggested further reading:

Noble, David F. "Social Choice in Machine Design: The Case of Automatically Controlled Machine Tools." *Politics & Society* 8, nos. 3-4 (1978): 313-347.
Hobsbawm, Eric J. "The Machine Breakers." *Past & Present* 1 (1952): 57-70.

Week 8: Technological Rationality — Critical Theory and the STS Quarrel

One genealogy: Marcuse's technological rationality, answered by his student Feenberg's critical theory of technology, flanked by Winner's technics-out-of-control — then two short polemics on what STS lost when it dropped Marx. The course's most direct address to STS as a discipline.

Marcuse, Herbert. *One-Dimensional Man*, chs. 1 and 6. Boston: Beacon Press, 1964.

Winner, Langdon. *Autonomous Technology: Technics-out-of-Control as a Theme in Political Thought*, Introduction and ch. 2. Cambridge, MA: MIT Press, 1977.

Feenberg, Andrew. *Questioning Technology*, ch. 1, "Technology, Philosophy, Politics," and ch. 7, "Critical Theories of Technology." London: Routledge, 1999.

White, Hylton. "Materiality, Form, and Context: Marx contra Latour." *Victorian Studies* 55, no. 4 (2013): 667-682.

Hamlin, Christopher. "STS: Where the Marxist Critique of Capitalist Science Goes to Die?" *Science as Culture* 16, no. 4 (2007): 467-474.

Suggested further reading:

Marcuse, *One-Dimensional Man*, ch. 9; Winner, *Autonomous Technology*, chs. 1 and 3; Feenberg, *Questioning Technology*, chs. 4-6 ("Democratic Rationalization"); Feenberg, *Transforming Technology*. Albany: SUNY Press, 2002.

Kirkpatrick, Graeme. *Technical Politics: Andrew Feenberg's Critical Theory of Technology*. Manchester: Manchester University Press, 2020.

Part IV: The Factory's Outsides

Week 9: Social Reproduction — Technology and the Labor of Life

Capitalism counts market labor as the only "work" while the labor that produces and sustains the worker is naturalized into nonexistence. Mies supplies the historical mechanism — the housewife as a social category created, with the state's help, alongside the colony — and Haraway names the restructuring made possible by (not caused by) the new technologies.

Federici, Silvia. "Wages Against Housework" (1975). In *Revolution at Point Zero: Housework, Reproduction, and Feminist Struggle*. Oakland: PM Press, 2012.

Federici, Silvia. *Caliban and the Witch: Women, the Body and Primitive Accumulation*, ch. 2, "The Accumulation of Labor and the Degradation of Women." New York: Autonomedia, 2004.

Mies, Maria. *Patriarchy and Accumulation on a World Scale: Women in the International Division of Labour*, ch. 3, "Colonization and Housewifization." London: Zed Books, 1986.

Bhattacharya, Tithi, ed. *Social Reproduction Theory: Remapping Class, Recentering Oppression*, Introduction and ch. 1. London: Pluto Press, 2017.

Haraway, Donna. "A Cyborg Manifesto: Science, Technology, and Socialist-Feminism in the Late Twentieth Century" (1985). In *The Haraway Reader*. New York: Routledge, 2004.

Suggested further reading:

Cowan, Ruth Schwartz. *More Work for Mother: The Ironies of Household Technology from the Open Hearth to the Microwave*. New York: Basic Books, 1983.

Wajcman, Judy. *TechnoFeminism*. Cambridge: Polity, 2004.

Federici, Silvia. *Patriarchy of the Wage: Notes on Marx, Gender, and Feminism*. Oakland: PM Press, 2021.

Vogel, Lise. *Marxism and the Oppression of Women: Toward a Unitary Theory*. Leiden: Brill, 2013 [1983].

Fortunati, Leopoldina. *The Arcane of Reproduction: Housework, Prostitution, Labor and Capital*. New York: Autonomedia, 1995 [1981].

Jarrett, Kylie. *Feminism, Labour and Digital Media: The Digital Housewife*. New York: Routledge, 2016.

Week 10: Racial Capitalism and the Informatics of Value

Primitive accumulation, read through its Black radical revision: slavery's relation to capitalism was organic, not adventitious. Rosenthal's plantation account books put a technology at the week's center — quantified labor management before Taylor had a name for it — and Franklin argues that capital's value-logic and digitality share one informatic form, bound to slavery's afterlives. Amrute's coders return us to the racialized present of "cognitive" work.

Marx, Karl. *Capital*, Vol. 1, ch. 24, "So-Called Original Accumulation," selections [Penguin Part 8].

Robinson, Cedric J. *Black Marxism: The Making of the Black Radical Tradition*, Introduction and ch. 1. Chapel Hill: University of North Carolina Press, 2000 [1983].

Leroy, Justin, and Destin Jenkins, eds. *Histories of Racial Capitalism*, Introduction. New York: Columbia University Press, 2021.

Rosenthal, Caitlin. *Accounting for Slavery: Masters and Management*, Introduction and ch. 3. Cambridge, MA: Harvard University Press, 2018.

Franklin, Seb. *The Digitally Disposed: Racial Capitalism and the Informatics of Value*, Introduction. Minneapolis: University of Minnesota Press, 2021.

Amrute, Sareeta. *Encoding Race, Encoding Class: Indian IT Workers in Berlin*, Introduction. Durham: Duke University Press, 2016.

Suggested further reading:

- Browne, Simone. *Dark Matters: On the Surveillance of Blackness*, Introduction and chs. 2–3. Durham: Duke University Press, 2015.
- Nakamura, Lisa. “Indigenous Circuits: Navajo Women and the Racialization of Early Electronic Manufacture.” *American Quarterly* 66, no. 4 (2014): 919–941.
- Roediger, David R., and Elizabeth D. Esch. *The Production of Difference: Race and the Management of Labor in U.S. History*. New York: Oxford University Press, 2012.
- Xiang, Biao. *Global “Body Shopping”: An Indian Labor System in the Information Technology Industry*. Princeton: Princeton University Press, 2007.
- Atanasoski, Neda, and Kalindi Vora. *Surrogate Humanity: Race, Robots, and the Politics of Technological Futures*, Introduction. Durham: Duke University Press, 2019.
- Couldry, Nick, and Ulises Ali Mejias. *The Costs of Connection: How Data Is Colonizing Human Life and Appropriating It for Capitalism*, chs. 1–2. Stanford: Stanford University Press, 2019.
- Beller, Jonathan. *The World Computer: Derivative Conditions of Racial Capitalism*, Introduction. Durham: Duke University Press, 2021.

Part V: Planet and Circulation

Week 11: Fossil Capital, Planetary Mine

Steam did not beat water on price or abundance; it won because the engine could be placed amid a population trained to industrious habits. Malm restates Panzieri at the scale of the energy system, with Thompson’s time-discipline as what the engine bought. Arboleda asks dependency’s questions of today’s extraction: the planetary mine of the fourth machine age.

Malm, Andreas. *Fossil Capital: The Rise of Steam Power and the Roots of Global Warming*, chs. 1–2 and 5–6. London: Verso, 2016.

Thompson, E. P. “Time, Work-Discipline, and Industrial Capitalism.” *Past & Present* 38 (1967): 56–97.

Arboleda, Martín. *Planetary Mine: Territories of Extraction under Late Capitalism*, Introduction and chs. 1–2. London: Verso, 2020.

Suggested further reading:

Amin, Samir. *Unequal Development: An Essay on the Social Formations of Peripheral Capitalism*, Part 3. New York: Monthly Review Press, 1976.

Saito, Kohei. *Marx in the Anthropocene: Towards the Idea of Degrowth Communism*, chs. 1 and 6. Cambridge: Cambridge University Press, 2023.

Foster, John Bellamy. *Marx’s Ecology: Materialism and Nature*. New York: Monthly Review Press, 2000.

Moore, Jason W. *Capitalism in the Web of Life: Ecology and the Accumulation of Capital*. London: Verso, 2015.

Week 12: The Digital Factory — Logistics, Platforms, and the Social Factory

Tronti's wager: when the factory's logic extends to society, workers' struggles drive capital's development. Cowen supplies circulation, Srnicek the platform form, and two ethnographies supply the shop floor — Delfanti's Amazon warehouse, where the barcode renders workers into information, and Chan, Selden, and Pun's Foxconn, whose industrial engineering is a dazzling display of contemporary Taylorism. The machinery chapter's present tense, on two continents.

Tronti, Mario. *Workers and Capital*, "Factory and Society" and "The Strategy of Refusal." Translated by David Broder. London: Verso, 2019 [1966].

Cowen, Deborah. *The Deadly Life of Logistics: Mapping Violence in Global Trade*, chs. 1-2. Minneapolis: University of Minnesota Press, 2014.

Srnicek, Nick. *Platform Capitalism*, chs. 1-2. Cambridge: Polity Press, 2016.

Delfanti, Alessandro. *The Warehouse: Workers and Robots at Amazon*, chs. 1-2. London: Pluto Press, 2021.

Chan, Jenny, Mark Selden, and Pun Ngai. *Dying for an iPhone: Apple, Foxconn, and the Lives of China's Workers*, chs. 4-5. Chicago: Haymarket Books, 2020.

Terranova, Tiziana. "Free Labor: Producing Culture for the Digital Economy." *Social Text* 18, no. 2 (2000): 33-58.

Suggested further reading:

Altenried, Moritz. *The Digital Factory: The Human Labor of Automation*. Chicago: University of Chicago Press, 2022.

Delfanti, *The Warehouse*, ch. 3.

Huws, Ursula. *Labor in the Global Digital Economy: The Cybertariat Comes of Age*. New York: Monthly Review Press, 2014.

Fuchs, Christian. *Digital Labour and Karl Marx*, chs. 1-4. London: Routledge, 2014.

Kassem, Sarrah. *Work and Alienation in the Platform Economy: Amazon and the Power of Organization*. Bristol: Bristol University Press, 2023.

Jones, Phil. *Work Without the Worker: Labour in the Age of Platform Capitalism*. London: Verso, 2021.

Alimahomed-Wilson, Jake, and Ellen Reese, eds. *The Cost of Free Shipping: Amazon in the Global Economy*. London: Pluto Press, 2020.

Part VI: Endings

Week 13: AI, Automation Discourse, and Socialist Technology

Pasquinelli closes the Babbage arc: a new machine imitates and replaces a previous division of labor, which makes AI this course's latest chapter rather than a rupture. Benanav disciplines the discourse with Week 3's treadmill. Then the constructive question the semester has earned: if the machinery we have is capital congealed, what would technology otherwise be? Cybersyn, the calculation debate, and Luddism as politics are three answers to argue with.

- Pasquinelli, Matteo. *The Eye of the Master: A Social History of Artificial Intelligence*, Introduction, ch. 1, and Coda. London: Verso, 2023.
- Benanav, Aaron. *Automation and the Future of Work*, chs. 1-2 and Conclusion. London: Verso, 2020.
- Medina, Eden. *Cybernetic Revolutionaries: Technology and Politics in Allende's Chile*, Introduction. Cambridge, MA: MIT Press, 2011.
- Mueller, Gavin. *Breaking Things at Work: The Luddites Are Right about Why You Hate Your Job*, Introduction and Conclusion. London: Verso, 2021.
- Morozov, Evgeny. "Digital Socialism? The Calculation Debate in the Age of Big Data." *New Left Review* 116/117 (2019): 33-67.
- Suggested further reading:*
- Peters, Benjamin. *How Not to Network a Nation: The Uneasy History of the Soviet Internet*, selections. Cambridge, MA: MIT Press, 2016.
- Casilli, Antonio A. *Waiting for Robots: The Hired Hands of Automation*. Translated by Saskia Brown. Chicago: University of Chicago Press, 2025.
- Gray, Mary L., and Siddharth Suri. *Ghost Work: How to Stop Silicon Valley from Building a New Global Underclass*. Boston: Houghton Mifflin Harcourt, 2019.
- Dyer-Witheford, Nick, Atle Mikkola Kjosen, and James Steinhoff. *Inhuman Power: Artificial Intelligence and the Future of Capitalism*. London: Pluto Press, 2019.
- Zuboff, Shoshana. *The Age of Surveillance Capitalism*, Introduction and ch. 1 — read together with Morozov, Evgeny. "Capitalism's New Clothes." *The Baffler*, February 4, 2019.
- Phillips, Leigh, and Michal Rozworski. *The People's Republic of Walmart*. London: Verso, 2019.
- Banerjee, Dwaipayan. *Computing in the Age of Decolonization: India's Lost Technological Revolution*. Princeton: Princeton University Press.