

**STS 6614 Advanced Topics in Technology Studies:
Engineering Studies**

Spring 2004: Tuesdays 1:00-3:45pm Lane 151

Course leader: Gary Downey Lane 332 hours: T-Th 1-2:30 or by appointment

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This course is an advanced graduate STS seminar designed to identify and pursue key current issues in engineering studies. In particular, the course focuses on the relationship between what counts as engineering knowledge and what counts as engineers at different times and in different places. The course begins by surveying the historical development of this relationship in France, Great Britain, Germany, and the United States. It then uses insights gained from this cross-national comparison to assess recent works on the epistemology of engineering knowledge and practice.

Requirements for class participants: (1) help shape the course around your research interests; (2) read and be prepared to discuss 100-150 pages of reading per week; (3) participate actively in class discussion; and (4) design and carry out a semester-long project that fits both course material and your research interests. Possible projects include exploring what counts as engineers and engineering knowledge in a particular country; wrestling with an interesting theoretical issue; building a web-based annotated bibliography on engineering studies; conducting a thorough literature review on an engineering studies topic; etc. Let's talk.

Project development includes four steps spread throughout the semester.

First is distribution of a 1-page description of a project, followed by listening to other members of the class discuss its details. The purpose is to bring other members of the class into each project.

Second is the directed discussion of 10-20 pages of 'primary documents' concerning your project. For this assignment, distribute the 10-20 pages to each class member one week prior to your assigned date. Please prepare a 1-3 minute presentation summarizing how you plan to use this material in your project (A short handout illustrating this relationship visually might be helpful). Plan to facilitate a 5-10 minute discussion of your primary documents.

Third is a directed discussion of your project in the context of some secondary reading distributed a week earlier to fellow class members. Please prepare a 20 minute presentation of your project, focusing on how you position this work in relation to other existing work. After your presentation, plan to facilitate a 20-minute discussion of your project and its development.

Fourth is your final project report, most likely a 12-15 page paper that could serve as draft material for a future publication. In preparing this report, give consideration to its possible audience, e.g. a particular journal. Tentative deadline = 5 pm Friday May 7 (subject to negotiation). Please do not request an incomplete in the course.

Required books: (Note: for lowest prices of used books online, see [fetchbook.info](#))

Alder, Ken. 1997. *Engineering the Revolution: Arms and Enlightenment in France, 1763-1815*. Princeton: Princeton University Press.

Bucciarelli, Louis A. 1994. *Designing Engineers*. Cambridge and London: The MIT Press.

Meiksins, Peter and Chris Smith. 1996. *Engineering Labour: Technical Workers in Comparative Perspective*. London and New York: Verso.

Noble, David. 1977. *America by Design: Science, Technology, and the Rise of Corporate Capitalism*. New York: Alfred A. Knopf.

Reynolds, Terry, ed. 1991. *The Engineer in America: A Historical Anthology from Technology and Culture*. Chicago and London: The University of Chicago Press.

Vicenti, Walter G. 1990. *What Engineers Know and How They Know It: Analytical Studies from Aeronautical History*. Baltimore and London: The Johns Hopkins University Press.

Vinck, Dominique. 2003. *Everyday Engineering: An Ethnography of Design and Innovation*. Cambridge and London: The MIT Press.

Other readings on Blackboard and on file for photocopying.

Course schedule:

January 23 (Friday 1:3:45pm) Introductory overview

Downey, Gary Lee and Juan C. Lucena. 1994. "Engineering Studies." Pp. 167-188 in *Handbook of Science, Technology, and Society*, edited by Sheila Jasanoff, Gerry Markle, James Petersen, and Trevor Pinch. Newbury Park, CA: SAGE. (21pp.)

Downey, Gary L., Arthur Donovan, and Timothy J. Elliott. 1989. "The Invisible Engineer: How Engineering Ceased to Be a Problem in Science and Technology Studies." *Knowledge and Society* 8: 189-216. (27pp.)

Downey, Gary Lee and Juan C. Lucena, "Knowledge and Professional Identity in Engineering: Code-Switching and the Metrics of Progress," under review at *History and Technology*. (30pp.)

Topics: I ask you to review these pieces both to get an overview of the sorts of work that has been carried out in engineering studies and to let you know up front what is at stake for me in this work and course.

January 27 Engineers and engineering knowledge in France 1

Alder, Ken. *Engineering the Revolution*. Read "Introduction" and Chs 1-3: "The Last Argument of the King," "A Social Epistemology of Enlightenment Engineering," "Design and Deployment," and "The Tools of Practical Reason." (159pp.)

Topics: A nice introduction to both the epistemology of engineering and the historical emergence of engineering among artillerymen in France. In what ways might this emergence be French?

February 2 (Monday 9-11 am) Engineers and engineering knowledge in France 2

Alder, Ken. *Engineering the Revolution*. Read Chs. 7-9: "The Machine in the Revolution," "Terror, Technocracy, Thermidor," "Technological Amnesia and the Entrepreneurial Order," and "Conclusion." (99pp.)

Crawford, Stephen. "The Making of the French Engineer." in Meiksins and Smith. (33pp.)

Topics: The first reading shows how engineering became institutionalized in the new republic. The second provides a nice summary account of the differences between state engineers and engineers in the private sector.

Project step #1: Distribute copies of a 1-paragraph summary of your project and then listen to discussion about it. The goal is to bring other members of the class into the project.

February 13 (Friday 9-11 am) Engineers and Engineering Knowledge in Great Britain

Smith, Chris and Peter Whalley, "Engineers in Britain: A Study in Persistence" in Meiksins and Smith. (33pp.)

Meiksins, Peter and Chris Smith, "Introduction: Engineers and Comparative Research," in Meiksins and Smith. (26pp.)

Brown, John K. 2000. "Design Plans, Working Drawings, National Styles: Engineering Practice in Great Britain and the United States, 1775-1945." *Technology and Culture* 41(April):195-240. (45pp)

Buchanan, R.A. 1989. *The Engineers: A History of the Engineering Profession in Britain, 1750-1914*. London: Jessica Kingsley Publishers. (selections TBA; approx 50pp.)

Topics: A combination of readings emphasizing the social class issues of engineers in Britain. Only the Brown piece offers insight into actual practices but does so nicely. The Meiksins/Smith introduction is included to illustrate how they position engineering as a problem of ‘technical labour.’

February 17 Engineers and Engineering Knowledge in Germany

Gispen, Kees. 1988. “German Engineers and American Social Theory: Historical Perspectives on Professionalization.” *Comparative Study of Society and History* 30, 3(Summer):550-74. (25pp)

Manegold, Karl. 1978. “Technology Academized: Education and Training of the Engineer in the Nineteenth Century,” *The Dynamics of Science and Technology: Sociology of the Sciences*, edited by Krohn, E. Layton, and P. Weingart, (Dordrecht, Holland: D. Reidel Publishing Company, 1978) II:137-158. (22pp)

Gispen, Kees. 1996. “The Long Quest for Professional Identity: German Engineers in Historical Perspective, 1850-1990.” In Meiksins and Smith. (47pp).

Herf, Jeffrey. 1984. “The Paradox of Reactionary Modernism, pp. 1-17, “Engineers as Ideologues,” pp.152-188, and “Reactionary Modernism in the Third Reich,” pp. 189-216 in *Reactionary Modernism: Technology, Culture, and Politics in Weimar and the Third Reich*. Cambridge: Cambridge University Press. (82pp)

Topics: Interesting readings illustrating the inappropriateness of the Anglo-American concept of profession in the German context as well as ideological affinities between engineers and National Socialism. Finally, some interesting insights into German “scientific technology.”

February 24 Engineers and Engineering Knowledge in the United States 1

Noble, David, “Part One: Technology as Social Production: Industry, Education, and Engineers,” pp. 1-67. In *America by Design*. (68pp)

Rae, John. “Engineers are People” In Reynolds, *The Engineer in America*. (17pp)

Reuss, Martin. “Andrew A. Humphreys and the Development of Hydraulic Engineering: Politics and Technology in the Army Corps of Engineers, 1850-1950.” In Reynolds, *The Engineer in America*. (34pp)

Brittain, James E. and Robert C. McMath, Jr. “Engineers and the New South Creed: The Formation and Early Development of Georgia Tech,” In Reynolds, *The Engineer in America*. (29pp)

Topics: Explore 19th century developments among engineers in the United States. Roles of the French and British traditions? Note the increasing association with private industry as source of justification.

March 2 Engineers and Engineering Knowledge in the United States 2

Meiksins, Peter. 1996. “Engineers in the United States: A House Divided.” In Meiksins and Smith. (38pp)

Noble, David, “Part Two: Corporate Reform as Conscious Social Production” (Chs 5-6, pp. 69-100 and Chs 8-9, pp. 167-256. (122pp.)

Meiksins, Peter. “The ‘Revolt of the Engineers’ Reconsidered.” In Reynolds, *The Engineer in America*. (28pp)

Topics: Explore the rapidly expanding engineering profession in the late 19th and early 20th centuries. Note the tension between serving society and serving industry, and how it gets resolved.

Project step #2: Jonson Miller

March 16 Engineers and Engineering Knowledge in the United States 3

Layton, Edwin. 1971. "Mirror Image Twins: The Communities of Science and Technology in 19th Century America." *Technology and Culture* 12 (October): 562-80. (19pp).

Sinclair, Bruce. "Local History and National Culture: Notions on Engineering Professionalism in America." In Reynolds, *The Engineer in America*. (13pp)

Seely, Bruce. "Research, Engineering, and Science in American Engineering Colleges, 1900-1960." *Technology and Culture* 34, 2(April):344-86. (43pp).

Reynolds, Terry and Bruce Seely. "Striving for Balance: A Hundred Years of the American Society for Engineering Education." *Journal of Engineering Education* 82, 3(July):136-151. (16pp)

Reynolds, Terry S. "Defining Professional Boundaries: Chemical Engineering in the Early 20th Century." In Reynolds, *The Engineer in America*. (23pp)

Topics: Follow selected issues in engineering in the 20th century, including the increasing importance of the engineering sciences.

Project step #2: Brent Jesiek, Gary Downey

March 23 "Object Worlds" in Engineering

Bucciarelli, Louis. *Designing Engineers* (read 125pp)

Topics: Assess use of the concept of object worlds to account for differences among engineering perspectives on the job. Also grapple with the concept of engineering design.

Project step #2: So Yeon Park, Zaijing Sun

March 30 A philosophical 'anatomy' of design knowledge I

Vicenti, Walter, *What Engineers Know*: "Introduction," pp. 3-15; "Design and the Growth of Knowledge: The Davis Wing and the Problem of Airfoil Design, 1908-1945," pp. 16-50; "Establishment of Design Requirements: Flying-Quality Specifications for American Aircraft, 1918:1943," pp. 51-111; "A Theoretical Tool for Design: Control-Volume Analysis, 1912-1953," pp. 112-136. (133 pp)

Topics: Assess an effort to formulate an abstract *a priori* theory of design knowledge in engineering. Also acquire command of some interesting case studies.

Project step #2: Liam Kelly, Frankie Bausch

April 6 A philosophical 'anatomy' of design knowledge II

Vicenti, Walter, *What Engineers Know* "Data for Design: The Air-Propeller Tests of W.F. Durand and E.P. Lesley, 1916-1926," pp. 137-169; "Design and Production: The Innovation of Flush Riveting in American Airplanes, 1930-1950," pp. 170-199; and "The Anatomy of Engineering Design Knowledge," pp. 200-240. (103 pp).

Topics: Assess an effort to formulate an abstract *a priori* theory of design knowledge in engineering. Also acquire command of some interesting case studies.

April 13 Can understanding engineering work as practice help engineers?

Vinck, Dominique, *Everyday Engineering* (125pp)

Topics: Assess an effort to use ethnographic methods to map design practices in engineering, with the goal of improving those practices. Raises the question of intervention in explicit ways.

April 20 Project discussions 1

Readings assigned by project leaders

Project step #3: Liam Kelly, Frankie Bausch, Yiannis Antoniou

April 27 Project discussions 2

Readings assigned by project leaders

Project step #3: SoYeon Park, Zaijing Sun, Brent Jesiek

May 2 Project discussions 3

Readings assigned by project leaders

Project step #3: Jonson Miller, Gary Downey