

HISTORY OF TECHNOLOGY FROM THE INDUSTRIAL REVOLUTION TO TODAY

HISTORY 3716 (CRN 13060) and **STS 3716** (CRN 14723)

Spring Semester 2006

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Office Hours: 9:30-10:30 AM, Tues. and Thurs., and other times. Please e-mail or call for an appointment.

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Readings and other information can be found on Blackboard.

Course web page: <http://www.history.vt.edu/hirsh/hist3716/hist3716-home-s06.htm>

Professor's web page: <http://www.history.vt.edu/hirsh/>

Technological change has occurred rapidly in the 19th, 20th, and 21st centuries, contributing to the remaking of our physical and social environments. In this course, we will examine the causes and manifestations of technological change and discuss how humankind, especially in the United States, has accommodated to it. By studying case histories, we will see how technology has changed in substance and in organization through the past two centuries. In addition, the course will focus on how the government and public have become increasingly involved in motivating and limiting technological innovations.

Generally, the course seeks to develop an understanding of the forces and circumstances that affect the way technology evolves and the way technology affects the ways humans live and work. The course is divided into three sections. The first section, "The Industrial Revolution in America," provides the backdrop for how the United States became such a fertile country for technological innovation. The next sections, "Modern Technology and its Effects" and "Society's Effects on Technology," reflect an emphasis on the reciprocal impacts of technology and society. In studying this history, we will not accept technology uncritically. Rather, we will learn how its use has acted as a powerful force in society.

COURSE GOALS

Students should gain the following by the end of the course:

- 1) An historical understanding of the development of technology.
- 2) An appreciation for the social dimensions of technology—i.e., the way society and technologies interact in subtle and explicit ways.
- 3) An enhanced ability to communicate your understanding of historical events.

This course is the second of a two-semester sequence in history of technology. The History Department also offers History 3715, which deals with the development of technology from prehistoric times to the beginnings of the industrial revolution in England and the United States. History 3715 is **not** a prerequisite for this course.

COURSE REQUIREMENTS:

Two mid-term examinations, one paper, a final examination, and substantive class participation. Grades will be assigned using the following formula:

Exams 1 and 2:	45.0%	(22.5% each)
Paper:	22.5%	
Final exam:	22.5%	
Class participation (incl. anchor ass., attendance, etc.):	10.0%	
Total:	100%	

The paper is due April 11. Instructions can be found later in this syllabus. The standard grading system will be used for the course (60-69=D; 70-79=C; etc.). Pass/Fail students should remember that they need at least the equivalent of a D to pass (not a D-). I am happy to review grades given on assignments, with

the following stipulation: I will be amenable to change grades within a week after I have handed back assignments. After that period, I will discuss the assignment with students, but I will not make changes in grades.

The honor code will be strictly enforced in this course. All assignments submitted shall be considered graded work unless otherwise noted. All aspects of your course work are covered by the honor system. Honesty in your academic work will develop into professional integrity. The faculty and students of Virginia Tech will not tolerate any form of academic dishonesty.

Any student that has a documented disability and will need an accommodation because of a disability should contact the professor early in the term.

Common Courtesy and Electronic Equipment Policy: For the sake of others (and me!), please disable the ringer on your cell phones before coming to class. Feel free to use a computer in class, but only for class purposes. If we are discussing a topic and you want to find related information on the web, go for it! But please do not use your computer for general web surfing, e-mail, blog writing, IM-ing, or other unrelated work. I find this use of computers in class to be rude and annoying. In class, I want you focused on our work. You have plenty of time outside of class for other online activities.

REQUIRED READING:

C. W. Pursell, Jr., ed., *Technology in America: A History of Individuals and Ideas* 2nd ed., (Cambridge, MA: MIT Press, 1990), Paperback, ISBN 0-262-66067-9 cited below as "Pur.," followed by the chapter numbers.

You will also be required to read articles that can be found on Blackboard. Questions to help you understand the important aspects of the books and articles are also available on Blackboard. A few new readings may be added during the semester. You will be responsible for reading these selections as well. The full bibliographic citations for the readings can be found on Blackboard too.

Please note that the readings are meant to supplement the lectures. They have been chosen to amplify upon themes discussed in class. Because of time constraints, however, they will not always be addressed explicitly in lectures. Questions from these readings will be included on exams, as the articles constitute an integral part of the class experience. In other words, this is not a high-school class in which the instructor repeats what is contained in the readings. The readings, therefore, will not substitute for attendance in class.

TENTATIVE SCHEDULE:

Topic #

Jan. 17 **0** Course Introduction

The Industrial Revolution in America

Jan. 19 **1** Setting for Technology in America (Pur. 1-3,5 Jefferson letters, and Dublin article)

Jan. 24 Special Class: Doing historical

Jan. 26 Edison technologies

Jan. 31 **2** Iron Structures and Engineering in the 19th Century (Pur. 8, Kanigel, and Peters articles)

Feb. 2 **3** Origins of Modern Engineering as a Profession (Pur. 6, and Layton article)

Feb. 7 **4** The Mechanization of Agriculture in the US (Pur. 7)

Feb. 9 **5** Growth of Large Technological Systems I: The Chemical Industry (Pur. 9 and Cowan #1 article)

- Feb. 14 **6** Growth of Large Technological Systems II: The Electrical Industries (Pur. 10, Pur. 11, and van Bramer article.)
- Feb. 16 **7** Business and Technology: A link to the 20th century (Pur. 12, Chandler extract, and Maier chapter)
- Feb. 21 Exam #1

Modern Technology and its Effects

- Feb. 23 **8** Technology and Industrial Management (Pur. 15 and Montgomery article)
- Feb. 28 **9** Revolution in Transportation: Development and Social Impact of Automobiles (Pur. 16, Bryant and Piller articles). **Feb. 27 is the last day to drop courses without the dean's approval.**
- Mar. 2 **10** Revolution in Transportation: Aviation Technology (Pur. 18 and Culick article).
- Mar. 7, 9 Personal research projects during spring break
- Mar. 14 **11** Technology and Women (Cowan #2 article and Pur. 13)
- Mar. 16 **12** Yesterday's Tomorrows: Technology and the Future (Science 84, "If this is the Future.." article, and Silverman/Petzinger "The Future is now..." article))
- Mar. 21 **13** Invention in Modern America (Schmookler, Jewkes, Petroski, and Israel , NPR, and Business Week, "Patent Epidemic" articles)
- Mar. 23 **14** The Computer Revolution (Original accounts of transistor's invention, Ceruzzi and Friedel articles)
- Mar. 28 Exam #2

Society's Effects on Technology

- Mar. 30 **15** Science, Technology, and Government: A New Relationship (Cowan #3 article)
- Ap. 4 **16** Science, Technology, and Government: The Space Race as a case study (Pur. 22, and Newell article)
- Ap. 6 **17** The Restive Public of Science and Technology (Weinberg article)
- Ap. 11 **18** Energy in American History (1973 Energy Crisis, Jaffe, Barlett, and Energy Policy 2005 articles) **PAPER DUE TODAY.**
- Ap. 13 **19** The Electric Power Industry as the Infrastructure for American Life and Business (Pur. 20, Hirsh, and Wasserman articles)
- [Ap. 14 Deadline to reschedule final exams through Dean's office if conflicts exist.]
- Ap. 18 **20** The Rise and Fall of Nuclear Power Technology (Pur. 21, Kemeny "Overview," Stoler, and Rhodes articles)
- Ap. 20 **21** The Origins and Impact of the Environmental Movement (Environmental extracts and Sale article)

Ap. 25	22 Environmental vs. Energy Needs: The Alaska Pipeline (Alaska pipeline articles)
Ap. 27	Possible Topic (time permitting): New Technological Perspectives at the turn of the Century
May 2	Course Conclusion (Brand and Naisbit articles)
May 5, Fri.	10:05 AM. Final Exam in the regular classroom (No changes of time except with Dean's permission. <u>The deadline for arranging changes is 14 April.</u>)

PAPER ASSIGNMENT

Background to Assignment: Technology consists of more than simple hardware or pieces of machinery. While tools, machines, artifacts, inventions, and processes are elements of technology, so are the components of knowledge and organization. Meanwhile, the history of technology is more than just a chronological narrative of inventors and their creations. It is a study of how humans adapted the natural world to their needs and desires in different time periods and cultures. Besides machinery, historians must be conscious of social, economic, cultural, and psychological elements.

A. The Assignment: Keeping these concerns in mind, choose a technology or technological process and discuss it by answering the following questions:

- Why and how was it developed? What need or motivation was there for the innovation? (Money? Military security? Replacing another technology that no longer was efficient?) What individual people were involved and what were their goals? In other words, what was the background and history of this development?
- What did the technology do? Describe the innovation in enough detail so that I know you understand how it works. There is no need to write a highly technical monograph about the technology; just write a simple, yet informative, description that discusses the technology's major features. Why was it an improvement over what preceded it?
- What impact did the innovation have on society and on other technologies? How did it change people's lives, and how did it affect the development of other technologies?

The purpose of this paper is to give you more experience with concepts and themes in the history of technology. Your case study should provide insight into the nature of technological innovation and its impact on society. Make sure the paper is historical and analytical—not just descriptive. In other words, I am not looking for a chronology of events. Rather, I want an historical analysis of the evolution of a technology that explores the subject from both a social and technical perspective. The surest way to receive a poor grade is to overlook the historical aspect of the assignment.

B. Guidelines:

- 1) The paper should be written on an innovation made during the time period we are studying in the course—i.e., in the years between about 1800 to the present.
- 2) Do not write on an innovation I have lectured about (or will lecture about) in class. I want you to study something new. See me (or e-mail me) for approval before you begin work on the paper.
- 3) Make sure your paper is focused on one development only. You could conceivably write about the Kodak camera, but do not write about all of photography. You may need to write about aspects of these broader subjects, but I want a narrowly focussed paper on a single innovation.
- 4) Give your paper an appropriate title. Write a good introductory paragraph that informs the reader about the paper's topic and argumentative thrust.
- 5) Do not write gratuitous final paragraphs that praise the subject of your paper. Your subject does not need to have been the most significant invention in history to be worthy of a paper. I.e., don't overstate your case!
- 6) Use footnotes or endnotes throughout your paper to indicate the source of your information. See a good writing primer to help you include notes at appropriate points. At the least, **you should use one note for each paragraph** that contains information not considered common knowledge. Use any consistent note style that you like, though most historians use the so-called Chicago style of notes. Failure to use notes constitutes plagiarism, which is an honor code violation at Virginia Tech. Absence or inadequate use of notes will incur a severe penalty (at least 15 points).

- 7) List the sources of your information in a bibliography. Supply the Virginia Tech call numbers for the books you used. You should list at least five sources exclusive of encyclopedias. Make sure you check the periodical indexes for articles as well as VTLS for books. In other words, don't just depend on books, because there may be few for your subject. Feel free to use the World Wide Web for information too, but you need to include at least three published (hard copy) sources in your bibliography. Penalty for omission of sources: 5 points per missing source.
- 8) The paper should be 500 words long, plus or minus 50 words. This number equates to about 2.5 pages. The paper must be double spaced with margins no bigger than 1.5 inches on each side (1 inch on 3 sides and 1.5 inches on the right side would be fine.) Include a word-count at the end of the text. If the paper is more than 10% too long (or too short), I will deduct 5 points for each 10% increment. (I.e., 5 points off for 10.1 to 19.9% too long or short; 10 points off for 20.1 to 29.9% too long or short, etc.) If you do not include a word count, I will deduct 10 points and then count the words myself to see if other deductions are called for.
- 9) Include pictures if they will help in describing the innovation. The picture captions do not count in the word limit.
- 10) Proofread your paper to make sure you did not make spelling, typing, and grammatical errors. For every error more than 4, I will deduct 1/2 point. Feel free to use computer spell- and grammar-checkers.
- 11) For your own protection, make a copy of your paper (or your word processor file) and keep it in a safe place.
- 12) The word "it's" means "it is." Do not confuse the contraction with "its."
- 13) Avoid using the verb "to be." ("To be" is the infinitival form of "am," "is," and "are" in all tenses.) The verb often invites the use of passive voice (which hides historical accountability) and contributes to dull sentences. Penalty for use more than 4 times in paper: 1/2 point per use. See "Writing Tips" on course web page and writing style manuals for further explanations. Also read the chapter by Good on Blackboard called "Word War II: To Be or Not To Be" for help on this rule.
- 14) Do not use quotations from other sources that are longer than 1 sentence, especially those from secondary sources (i.e., articles or books written about the subject you are studying). Long quotations are often used to suggest understanding, but they often hide a student's misunderstanding of a concept. Paraphrase what the author has written instead. You may be able to say it better in your own words. I will deduct points for the excessive use of quotations.

See Blackboard for links to more tips for good writing.

LATE PAPER POLICY: I will accept papers that are handed in late, but with the following penalty. Each calendar day (including weekend days) after the due date, I will deduct 10 points. (Late papers may be submitted by e-mail on nonclass days to avoid further penalties.) This policy may appear harsh, but you have known about the due date since the beginning of the term. Please begin work on the paper early enough so that you do not incur this penalty.

CLASS PARTICIPATION: ANCHOR-PERSON'S RESPONSIBILITIES

To encourage discussion and understanding in class, a few students will be designated "anchors" for each class. The anchor will be conversant in the subject of the day and will be called upon to discuss the reading or lecture content. The role of anchor will rotate throughout the class so that each student will participate at least **twice** during the term. The class participation component of a student's grade will be based largely on his/her performance as an anchor, but don't hesitate to speak up on other occasions.

Rationale: In the "real" world, you will often be expected to interact verbally with colleagues. You will need to think "on your feet" and be reasonably coherent. This activity will help in preparing for these situations. Also, even though class participation counts toward the final grade, many students are simply non-participants. This activity will force people to open up. Note: Just because you are not an anchor-person does not relieve you of the responsibility of preparing for class. You never know when the instructor will get "mean" and ask other students about the assignment.

Also make sure you have been an anchor at least **twice** during the term. If you do not participate as an anchor, you will receive a "0" for a portion of your final grade.

Pre-Class Obligations:

- Be totally conversant in the reading of the day.
- Perform extra work in the library. Read about the subject in a good encyclopedia (such as the *Britannica*) and find other articles on the same subject (see the footnotes in the assigned articles, for example).

- Hand in your list of outside sources, using any consistent style of bibliographic citation system. (I.e., include the name of the article, its author, book/journal title, volume number, publisher, page numbers, and Virginia Tech call number.) Don't list encyclopedia articles, though you may certainly use them to get citations for other readings.
- You are required to locate and read at least two sources from books, journals, etc. You are also required to locate and peruse at least two Web sites and include their URLs. (Total number of sources: 4)
- Write a brief (**2 paragraph minimum**) description of the important points you discovered in each of your hard-copy sources. (I.e., two sets of descriptions.) For each web site, describe the on-line document and explain briefly (**in one paragraph, minimum**) its content and usefulness for enhancing your understanding of the subject.
- List the printed sources and web sites on a separate sheet at the end of your report. I will remove this sheet before returning your assignment to you.

In-Class Obligations: You may be asked to:

- Summarize the major points of the readings.
- Respond to questions from the professor and other students.
- Offer opinions based on the readings, previous classes and assignments, and experiences in life.