History of Computers and the Internet
Syllabus v1.1

School of Information 379/RC Soc. Sci. 379/History 379
Prof. Paul N. Edwards
University of Michigan, Winter 2010
TTh 1-2:30, USB 2260
Sections: Th 5:30-6:30, 120 Dennison; Fri 8:30-9:30, 130 Dennison
Course Description

This nontechnical course covers the development and use of computers from the ancient world to the present. We will discuss automatic calculation from the abacus to the integrated circuit; logic machines from Boole to neural networks; and the evolution of programming languages from assemblers to Ada.

Our primary focus will be the social, political, and cultural contexts of post-1939 digital computers and computer networks. We will explore such topics as:

- A design for a steam-powered, mechanical computer in Victorian England
- How early computers cracked the Nazi Enigma cipher during World War II
- How the Cold War changed computers -- and how computers changed the Cold War
- Why digital computing replaced well-developed analog methods in the 1940s and 1950s
- Computing in Europe, the Soviet Union, and the developing world
- How hackers helped shape minicomputers and the Internet
- How amateur hobbyists invented the personal computer
- The story behind the World Wide Web

This course makes the argument that new technologies and their social effects evolve together along a variety of dimensions. Some of these are technical: innovation, design, and opportunity. Some are social: funding sources, societal values, and organizational structures. Still others are macro-scale economic, political, and social forces.

The major questions that motivate our study of computers will concern “why” issues. Why were computers invented? Who wanted them, and for what purposes? How have computers changed the shape of society and culture — and how did society and culture shape them? The course is relevant to anyone interested in the history, politics, and culture of technology.

Prerequisites: none. However, students completely unfamiliar with basic computer concepts will be expected to take extra time to learn these.

Open to: juniors and seniors. Sophomores admitted by permission of instructor.

Preference to: Informatics and History concentrators, and STS minors.

Meets requirements for:

- Upper-level Writing Requirement (ULWR), if desired
- Social Science distribution requirement
- Science, Technology & Society minor (counts as a research seminar or elective, http://www.umich.edu/~umsts)
- Social Informatics concentration (elective, if approved by your advisor)
SI589 and History 594 sec. 003 (3 credits): The graduate level of this course counts toward the graduate certificates in Science, Technology & Society and Science, Technology & Public Policy (STPP). It also counts as an elective in SI’s Information Policy specialization.

Only graduate students may register under the SI589 and History 594 course numbers. Course requirements for graduate students differ somewhat from those below, and the course has a separate syllabus.

Instructors:

Prof. Paul N. Edwards  
Email: pne@umich.edu  
Office hours: Thursdays 2:45-4 PM or by appointment, at 3078 West Hall (School of Information)

GSI: Clint Newsom  
Email: newsomc@umich.edu  
Office hours: Thursdays 4-5 at Espresso Royale on State Street

Expectations:

Class attendance. You can miss up to 3 class sessions during the semester without penalty. After that, each missed class will result in a one-third letter grade reduction in your final course grade. For example, if your grade should be a B+ but you missed a total of six classes during the semester, you would receive a C+ instead, or the equivalent mention on your narrative evaluation (RC students).

In the past, students have occasionally tried to get around this policy by pretending that someone in their family has died. Therefore, if you must miss classes because of a death in the family, you will need to submit a copy of the death certificate. Similarly, I will need a signed statement from a doctor if you miss class because you’re sick.

For these reasons, I strongly suggest that you not miss any classes early in the semester. Save your "skip" days for later in the semester, when you'll really need them.

Section attendance. Section attendance is also required. You may miss up to 2 sections without penalty; beyond that, the penalties above also apply.

Laptops, cellphones, iPods, etc.: just as you would not read a newspaper in class, please respect your instructors and your fellow students by refraining from non-course-related use of electronic devices during class. This means no websurfing, texting, twittering, etc. Active screens, as well as the diversion of your attention, are distracting for everyone.

Plagiarism policy: At the University of Michigan and in professional settings generally, plagiarism is an extremely serious matter. Please paraphrase wherever possible, since this helps you process and understand what you have read. If truly necessary, you can quote
published work, but quotations must be clearly marked and properly attributed. You may obtain copy editing assistance, and you may discuss your ideas with others, but all substantive writing and ideas must be your own or else be explicitly attributed to another, using a citation sufficiently detailed for someone else to easily locate your source.

**All cases of plagiarism will be reported immediately.** There will be no warnings, no second chances, no opportunity to rewrite. **Consequences can range from failing the assignment (a grade of zero) or failing the course to expulsion from the University.** For additional information about plagiarism, see the Rackham pamphlet on Academic Integrity and Plagiarism: What It is and How to Recognize and Avoid It from Indiana University. If you have any doubts about whether you are using the words or ideas of others appropriately, please ask.

**Assignments:**

**NB:** You must complete all of the assignments, and you must achieve a passing grade in each of the following components in order to pass the class.

1. **Class and section participation** (25 percent of grade). Most class sessions will be 50-minute lectures followed by Q&A; you should participate frequently in these. You should plan to contribute at least twice at each discussion section meeting.

2. **First paper** (1000-1500 words, 15 percent of grade) due February 2. ULWR students must revise and resubmit by February 16.

3. **Second paper** (2000-2500 words, 20 percent of grade), 2 copies due in class February 25. ULWR students must revise and resubmit by March 9. Revised version must include short statement of how you responded to instructor review.

4. **Term research project** (3500-4500 words, 35 percent of grade). This can be a traditional paper 3500-4500 words in length, or the same amount of writing presented in another medium, such as a website. Up to three students may collaborate on a single project. **All projects must involve a very substantial, fully referenced research component.** In all cases, the assignment has four parts.

   a. A 300-500 word prospectus, clearly describing your topic and listing sources, is due in class on February 11. You must turn this in when it is due, but you can change your topic later by turning in another prospectus by February 25.

   b. An annotated source list (minimum 1000 words) describing the materials you will use for your term research project. The list must include at least 12 high-quality sources directly related to your topic. Discussions of each reference should be at least 3-6 sentences for short pieces such as articles or websites, and at least 8-10 sentences for long pieces such as books. Each description should indicate how you will use the source to develop or support your main argument(s). Due in class March 18.

   c. A full-length, high-quality draft (3500-4500 words) is due in class April 1. It will be returned within 10 days, with comments and suggestions for revisions.
(d) The final version, edited, revised, and proofread, is due at the final class session on April 20. Final versions must respond to comments on the draft and incorporate extensive revisions.

**Extension policy:** no extensions, period. Don’t even think about it.

**Required books:**


Fred Turner, *From Counterculture to Cyberculture* (University of Chicago Press, 2006)


Janet Abbate, *Inventing the Internet* (MIT Press, 1999)

All course books are on reserve at Shapiro Undergraduate Library.

**Course Schedule**

**Thursday 1/7** — **Introduction: Computing in the Pre-industrial World**

**Tuesday 1/12** — **Automatic Computation in the 19th Century**

**Reading:** *Computer*, Chapters 1 and 2

Report of the Committee, consisting of Professor Cayley, Dr. Farr, Mr. J. W. L. Glaisher, Dr. Pole, Professor Fuller, Professor A. B. W. Kennedy, Professor Clifford, and Mr. C. W. Merrifield, appointed to consider the advisability and to estimate the expense of constructing Mr. Babbage’s Analytical Machine, and of printing Tables by its means. Drawn up by Mr. Merrifield, 1878.

**Recommended:** L.F. Menabrea with notes by Lady Ada Lovelace, “Sketch of the Analytical Engine” (1842)

Explore other resources at the Fourmilab Analytical Engine website, such as an emulator of the Analytical Engine

**Thursday 1/14** — **NO CLASS — please do the readings below and attend your discussion section**
**Reading:** Small, “Analogue Computing Devices in the 19th and early 20th Centuries” (CTools)
The Vannevar Bush Differential Analyzer
International Slide Rule Museum — read the instructions and then solve at least 2 problems using the virtual slide rule on the website
Lang, 'Analog' was not a Computer Trademark!” (CTools; skim the technical sections)

**Recommended:** Analog Computer Museum and History Center

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**Tuesday 1/19 — Analog Computing**

**Reading:** see previous session

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**Thursday 1/21 — Information Technology before 1945**

**Reading:** Computer, Chapter 3
Yates, "Business Use of Information Technology During the Industrial Age” (CTools)
Grier, “Captains of Academe,” from When Computers Were Human (CTools)

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**Tuesday 1/26 — Computers and World War II**

**Reading:** Black, "Final Solutions," Village Voice, 2002
Luebke and Milton, “Locating the Victim: An Overview of Census-Taking, Tabulation Technology, and Persecution in Nazi Germany” (CTools)
Computer, Chapter 4
Konrad Zuse's early computers
World War II codebreaking in Britain

**Recommended:** Budiansky, "The Code War" (CTools)

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**Thursday 1/28 — Computers and the Cold War**

**Reading:** CBC Digital Archives on “Cold War Culture: The Nuclear Fear of the 1950s and 1960s.” Watch several video clips and listen to several radio episodes (your choice)
Bracken, “Warning and Intelligence,” from The Command and Control of Nuclear Forces, 1983 (CTools)

**Recommended:** Wikipedia entry on “Cold War” and its subentries. If you are unfamiliar with Cold War history, spend a while on this site.
Tuesday 2/2 — **Minds, Brains, and Analog Thought at the Dawn of the Computer Age**

**Reading:** Bush, “*As We May Think*” (1945) (CTools)
Small, “Negotiating a Place for Electronic Analogue Computers: The Analogue versus Digital Debate” (CTools)
Bowles, "U.S. Technological Enthusiasm and British Technological Skepticism in the Age of the Analog Brain" (CTools)

**Recommended:** von Neumann, *The Computer and the Brain* (1958), on reserve at Shapiro

**DUE:** First paper. No extensions, no exceptions, no kidding.

Thursday 2/4 — **Project Whirlwind and SAGE**

**Reading:** Everett et al., “SAGE — A Data-Processing System for Air Defense” (1957) (CTools)
Valley, “How the SAGE Development Began” (CTools)

**DUE:** Prospectus for final paper

Tuesday 2/9 — **Mainframes**

**Reading:** *Computer*, Chapters 5 and 6
Small, "General-Purpose Electronic Analog Computing: 1945-65" (CTools)

Thursday 2/11 — **Early Computer Languages and Software**

**Reading:** *From Airline Reservations to Sonic the Hedgehog*, Ch. 1-2
Ensmenger, “The Black Art of Programming” (CTools)

Tuesday 2/16 — **Computers and Culture in the 1960s**

**Reading:** Licklider, “Man-Computer Symbiosis” (1960) (CTools)
Van Creveld, “The Helicopter and the Computer” (CTools)
*From Counterculture to Cyberculture*, Introduction and Ch. 1

**Recommended:** *From Counterculture to Cyberculture*, Ch. 2. This chapter does an outstanding job of describing the 1960s counterculture.

Thursday 2/18 — **Artificial Intelligence**

**Reading:** Turing, “Computing Machinery and Intelligence” (1950) (CTools)
Newell, “Intellectual Issues in the History of Artificial Intelligence” (CTools)

**Recommended:** Stanford Encyclopedia of Philosophy, "The Church-Turing Thesis"

Tuesday 2/23 — **Software, part II**

**Reading:** *From Airline Reservations to Sonic the Hedgehog*, Chapter 4  
*Computer*, Chapter 8  
Hoare, “Programming: Sorcery or Science?” (CTools)

**Recommended:** *From Airline Reservations to Sonic the Hedgehog*, Chapters 5-6

Thursday 2/25 — **Hackers, Timesharing, Unix, and Free Software**

**Reading:** *From Counterculture to Cyberculture*, Chapters 3 and 4  
Hauben, "On the Early History and Impact of Unix"

**DUE:** second paper

Winter break — Feb. 27-March 5

Tuesday 3/9 — **From Mini to Micro**

**Reading:** *Computer*, Chapters 9 and 10  

Thursday 3/11 — **ARPANET**

**Reading:** *Inventing the Internet*, pp. 1-81  
Ornstein, *Computing in the Middle Ages*, Ch. 14 (CTools)

Tuesday 3/16 — **From ARPANET to Internet**

**Reading:** *Inventing the Internet*, pp. 83-145  
Gerovitch, “InterNyet: Why the Soviet Union did not build a Nationwide Computer Network” (CTools)

Thursday 3/18 — **PCs: Apple, IBM, and Microsoft**

**Reading:** Freiberger and Swaine, *Fire in the Valley*, pp. 253-310, 328-354 (CTools)  
Ferguson and Morris, *Computer Wars* (CTools)

**DUE:** annotated source list for final paper
Tuesday 3/23 — **Hackers and Personal Computing**

**Reading:** *From Counterculture to Cyberculture*, Chapter 5  
*Computer*, Chapter 11

Thursday 3/25 — **PCs and GUIs**

**Reading:** *From Airline Reservations to Sonic the Hedgehog*, Chapter 8  
Reimer, *History of the Graphical User Interface* (not entirely reliable)

Tuesday 3/30 — **Graphics and Computer Games**

**Reading:** *From Airline Reservations to Sonic the Hedgehog*, Chapter 9  
Lenoir, “All but War Is Simulation: The Military-Entertainment Complex”  
(CTools)

Thursday 4/1 — **High Performance Computing**

**Reading:** Aspray and Williams, "Arming American Scientists: NSF and the Provision of Scientific Computing Facilities for Universities, 1950-73" (CTools)  
Dongarra et al., “Netlib and NA-Net: Building a Scientific Computing Community” (CTools)

**Recommended:** Mackenzie, “The Influence of the Los Alamos and Livermore National Laboratories on the Development of Supercomputing” (CTools)

**DUE:** Full-length, high-quality draft of final paper

Tuesday 4/6 — **Computer Networks**

**Reading:** Campbell-Kelly and Swartz, “History of the Internet: The Missing Narratives” (CTools)  
Sterling, “Pioneering Risk: Lessons from the US Teletext/Videotex Failure”

Thursday 4/8 — **The Internet**

**Reading:** *Inventing the Internet*, pp. 147-220  
Russell, “Rough Consensus and Running Code” (CTools)

Tuesday 4/13 — **The World Wide Web: Prehistory**

**Reading:** Wright, “*The Web Time Forgot*”  
P. L. Frana, ”Before the Web there was Gopher” (CTools)  
Howard Rheingold, “Xanadu, Network Culture, and Beyond,” Ch. 14 of *Tools For Thought* (online version of 1985 book)
CERN (European Laboratory for Particle Physics) web site on CERN and the history of the WWW. See especially the original proposal documents. Wikipedia, "History of the World Wide Web." Explore some of the links and sources.

Thursday 4/15 — **The World Wide Web**

**Reading:** *Computer*, Ch. 12
*From Counterculture to Cyberculture*, Ch. 8

Tuesday 4/20 — **Conclusion**

**No reading**

**DUE:** Final version of final paper