

History of Computers and the Internet

Winter 2011—Syllabus v3.1 (10 January 2011)

Most current syllabus always available [here](http://pne.people.si.umich.edu/PDF/379syll.pdf) (<http://pne.people.si.umich.edu/PDF/379syll.pdf>).

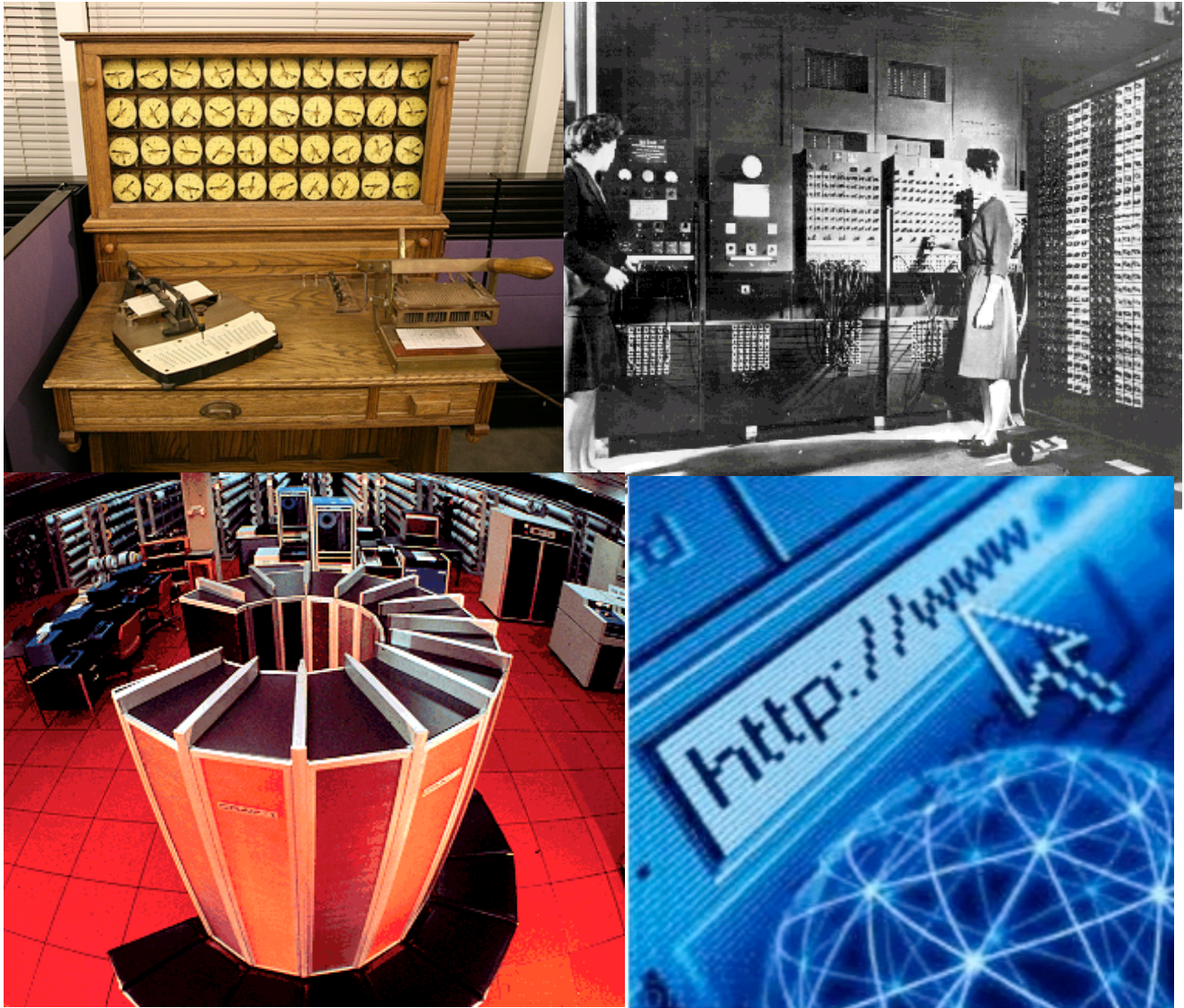
School of Information 379/RC Soc. Sci. 379/History 379

Prof. Paul N. Edwards

University of Michigan, Winter 2011

TTh 2:30-4:00, 1110 Weill Hall (Ford School)

Sections: Th 1-2, 506 BMT; Th 5:30-6:30, B134 MLB



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
- Why digital computing replaced analog methods in the 1940s and 1950s
- How the Cold War changed computers, and how computers changed the Cold War
- Computing in Europe, the Soviet Union, and the developing world
- How amateur hobbyists invented the personal computer
- Video games: their origins and their role in shaping modern computing
- The story behind the Internet and the World Wide Web
- Google, Facebook, Wikipedia, and Web 2.0

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 questions that motivate our study of computers 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 research these independently. Wikipedia is a reasonable resource for this purpose.

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

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

Meets requirements for:

- Social Science distribution requirement
- [Science, Technology & Society minor](#) (counts as a research seminar or elective)
- 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](#) (IPOL) 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, School of Information, 3439 North Quad
Email: pne@umich.edu
Office hours: Mondays 12:30-1:30 PM or by appointment
GSI: Purdom Lindblad
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Office hours: TBA

Course policies and 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.

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.

Policy on 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. Midterm exams will cover lecture and section material. You are welcome to share notes with others, but since the process of note-taking itself improves your retention and understanding, we expect everyone to take their own notes and to review them later. It's fine to use a laptop for this purpose. If you want to do this, however, you must sit in the **front of the room** (first six rows), and **wireless access must be turned off**. These are non-negotiable conditions of using a laptop during class. Wifi use creates a "[cone of distraction](#)" that harms both your class performance and that of those around you. Using email, Facebook, YouTube, ESPN, etc., will produce a **single one-time warning** from the instructor or GSI. Any further wifi use means no laptop access is permitted for the duration of the semester, and all subsequent notes must be taken longhand. *Cellphones should also be turned off at the start of every class.*

If you object to this policy, please do not enroll in this course.

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 the slightest doubt about whether you are using the words or ideas of others appropriately, please ask.

Assignments:

NB: In order to pass the class, you must complete all of the assignments and achieve a passing grade in class/section participation.

- (1) **Class and section participation** (20 percent of grade). Most class sessions will be interactive lectures followed by Q&A. You should plan to contribute **at least once in each lecture and at least twice at each discussion section meeting.** *If you attend but do not participate, you will lose points.*
- (2) **First midterm exam** (15 percent of grade), Tuesday February 8.
- (3) **Midterm paper** (2000-2500 words, 20 percent of grade). 2 copies due in class March 17.
- (4) **Second midterm exam** (20 percent of grade), Tuesday April 5.
- (4) **Term research project** (3500-4500 words, 25 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 or an iPhone app. Up to three students may collaborate on a single project. *All projects must involve a very substantial, fully referenced research component.*

Please see the much more detailed instructions on CTools.

- (a) A 300-500 word *prospectus* is due in class on February 17.
- (b) An *annotated source list* (minimum 1000 words) describing the materials you will use for your term research project. Due in class March 8.
- (c) A *full-length, high-quality draft* (3500-4500 words) is due in class March 29.
- (d) The *final version*, edited, revised, and proofread, is due at the final class session on April 19. Final versions must respond to comments on the draft and incorporate extensive revisions.

Extension policy: please ask your GSI in advance about an extension; do not assume you can have one. Assignments turned in more than 3 days after the due date will be subject to a penalty of one-third of a letter grade per day they are late.

Required books:

Martin Campbell-Kelly and William Aspray, *Computer: A History of the Information Machine* (Basic Books, 2004). **Please purchase the second edition (2004)**, not the first edition (1996)

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

Martin Campbell-Kelly, *From Airline Reservations to Sonic the Hedgehog: A History of the Software Industry* (MIT Press, 2003)

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

Course Schedule

Thursday 1/6 — Introduction: Computing in the Pre-industrial World

Guest mini-lecture: Ulysses J. Balis, "Ancient Greek 'High Technology' as Viewed through the Prism of the Antikythera Mechanism"

Tuesday 1/11 — Automatic Computation in the 19th Century

Reading: *Computer*, Chapters 1 and 2

L.F. Menabrea with notes by Lady Ada Lovelace, "[Sketch of the Analytical Engine](#)" (1842). Skip the mathematics — focus on the introductory paragraphs and the speculations about the powers of the Analytical Engine, in Lovelace's notes (at the end of the document).

[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: Explore other resources at the Fourmilab [Analytical Engine website](#), such as an emulator of the Analytical Engine

Thursday 1/13 — Analog Computing

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](#)

Tuesday 1/18— **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)

Thursday 1/20 — **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)

Tuesday 1/25 — **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.

Thursday 1/27 — **Reconceiving Minds at the Dawn of the Computer Age**

Reading: Bush, "[As We May Think](#)" (1945)

Small, "Negotiating a Place for Electronic Analogue Computers: The Analogue versus Digital Debate" (CTools)

Turing, "Computing Machinery and Intelligence" (1950) (CTools)

Simon and Newell, "[Heuristic Problem Solving: the Next Advance in Operations Research](#)" (1958)

Recommended: von Neumann, *The Computer and the Brain* (1958). The Google Book edition doesn't let you see the whole book, but it exposes enough to give you the general idea.

Tuesday 2/1 — **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)

MITRE Corporation, "[Semi-Automatic Ground Environment](#)"

Computer, Chapter 7

Thursday 2/3 — **Mainframes**

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

Review session for first midterm exam

Tuesday 2/8 — **First midterm exam**

Thursday 2/10 — **Early Computer Languages and Software**

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

Tuesday 2/15 — **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 2/17 — **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

DUE: Prospectus for final paper

Tuesday 2/22 — **Hackers, Timesharing, Unix, and Free Software**

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

Thursday 2/24 — **From Mini to Micro**

Reading: *Computer*, Chapters 9 and 10
Bill Gates, "[Open Letter to Hobbyists](#)" (1976)

Winter break — Feb. 26-March 6

Tuesday 3/8 — **ARPANET**

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

DUE: annotated source list for final paper

Thursday 3/10 — **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)

Tuesday 3/15 — **PCs: Apple, IBM, and Microsoft**

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

Thursday 3/17 — **Hackers and Personal Computing**

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

DUE: midterm paper

Tuesday 3/22 — **The Graphical User Interface**

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

Thursday 3/24 — **Graphics and Computer Games**

Reading: *From Airline Reservations to Sonic the Hedgehog*, Chapter 9

Recommended: Lenoir, "All but War Is Simulation: The Military-Entertainment Complex" (CTools)

Tuesday 3/29 — **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

Thursday 3/31 — **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"

Review session for second midterm exam

Tuesday 4/5 — **Second midterm exam**

Thursday 4/7 — **The Internet: guest lecture, Don Blumenthal, ICANN**

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

Tuesday 4/12 – **The World Wide Web**

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 4/14 — **Web 2.0: Google, Facebook, and Wikipedia**

Reading: *Computer*, Ch. 12

From Counterculture to Cyberculture, Ch. 8

Tuesday 4/19 — **Conclusion**

No reading

DUE: Final version of final paper