

History of Computing (COMP 111)

Version 2009.0 Beta (still in draft stage until this notice disappears)

The social and organizational history of humanity is intricately entangled with the history of technology in general and the technology of information in particular. Advances in this area have often been closely involved in social and political transformations. While the contemporary period is often referred to by such names as the Computing and Information Age, this is the culmination of a series of historical transformations that have been centuries in the making. This course will provide a venue for students to learn about history through the evolution of number systems and arithmetic, calculating and computing machines, and advanced communication technology via the Internet. Students who take this course will attain a degree of technological literacy while studying core historical concepts. Students who complete this course will learn the key vocabulary of the computing discipline, which is playing a significant role in modern human thought and new media communications. The History of Computing will be organized around the historical perspective. The relationships between social organization, intellectual climate, and technology will be examined and stressed.

Knowledge Area(s) Satisfied: Historical Knowledge

Skill(s) Developed: Critical Thinking Skills and Dispositions, Communications (Written and Oral), and Technology Literacy

Values Requirement(s): Satisfied None

Instructor Information

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Learning Outcomes

1. **Demonstrate the ability to evaluate and explain the forces of historical continuity and change.** In this course, historical continuity and change is evaluated from the invention of the number system circa 35000 BC, to counting machines, to calculating machines, and ultimately to computers and the Internet. We will examine the historical evolution of computing devices and how they relate to historical events and social forces of their time. Of particular note is the impact of mechanical computers before the electronic computing revolution that began in the 1940s-1950s, which impacted our understanding of navigation, planetary motion, and time
2. **Demonstrate an understanding of the relationships among historical events, culture, and social forces.** We'll consider the history of computing in the context of history and society. It is obvious that computing has a dramatic impact on all disciplines of thought since the 1940s and has a number of social, economic, political, and legal implications.
3. **Demonstrate an awareness that human values, ideas of justice, and methods of interpretation influence and are influenced by time, culture, and personal perspective.** We will address values, ideas of justice, and methods of interpretation by presenting different perspectives of computing. The texts themselves have been chosen to represent a wide variety of opinions and views of computing that are world-centric as opposed to USA-centric. The course will explore that many of the ideas that led ultimately to the invention of the personal computer, for

- example, were conceived outside of the United States of America over a period of centuries.
4. **Differentiate among historical and contemporary perspectives about the world with a view to fashioning a humane and just world.** Because computing is a contemporary phenomenon as well, opportunities abound to address social justice. One text specifically addresses these topics by presenting a view of the world in which computers and communications are the way toward a more level playing field, both economically and socially. We'll also address the work of the Free and Open Source Software Movements, which aim to make software freely available for anyone to use for any purpose. This movement is part of a transformation of the software industry.

Readings

This course will not rely upon a formal textbook. Instead a collection of books will be required and/or recommended at the discretion of the course professor/lecturer. Despite the youth of the field there is an established discipline of the history of computing, including a journal published by the Institute of Electrical and Electronic Engineers. There are several excellent books that bear the words computing and history in the title. However, the focus of these books is rather different than that of this course, so readings from multiple sources will instead drive the curriculum.

Required Reading

- **Paul E. Ceruzzi, *A History of Modern Computing, 2nd Edition***
This book is focused on the history of specifically modern digital computing. It begins in the 1940s and continues to present date.
- **Howard Rheingold, [Tools for Thought](#) (Available Online): *The History and Future of Mind-Expanding Technology***
Published in 1985, this book has been called retrospective futurism by many reviewers, because it presents both a retrospective and futuristic perspective on the computing field. Chronologically focused, *Tools for Thought* recounts the history with a focus on pioneers in the field and the impact these pioneers had on society—often without having computers to demonstrate their brilliance. With chapter titles such as "The First Programmer was a Lady", Rheingold provides a thought provoking yet lighthearted book that thoroughly motivates the history and future of computing. It was considered so ahead of its time that MIT Press (a prestigious press, especially for computer science and engineering texts) acquired the rights from a less well-known publishing company and republished the book in 2000.
- **Georges Ifrah, *Universal History of Computing: From Abacus to Quantum Computer***
A book translated from French, this book amounts to one of the most complete treatments of the history of computing and is focused on the conceptual, scientific, and technical achievements that made the invention of computers possible. The book begins with the abacus and number systems and works all the way through modern computing history, including the invention of digital computing and an emerging area known as quantum computing (a model that goes beyond Boolean Algebra and binary numbers by looking at quantum states).

Strongly Recommended Supplemental Textbook

- **Mark Kishlansky, Patrick Geary, and Patricia O'Brien, *A Brief History of Western Civilization: The Unfinished Legacy; Volume II, 5th Edition, Since 1555*, ISBN: 9780321449979**
This book will be used to provide the running background of historical figures, events, and cultures from 1555 to Present, which overlaps precisely with the historical period associated with mechanical and electronic computing. Students will be required to read selected chapters of this book for important background historical material and context.

Other Recommended Readings

- **Tim Berners-Lee, *Weaving the Web: The Original Design and Ultimate Destiny of the***

World Wide Web

For most people alive today, the web itself is considered a separate invention that was made possible mostly due to the computing revolution in general (Apple Computer invented hypertext, for example, which is a key component of the web) and a major advance in communications via ARPANet and Internet technologies. This book is written by the inventor of the web, who was a physicist/computer scientist working at CERN (a national research laboratory based in Switzerland).

- **Thomas Friedman, [The World is Flat: A Brief History of the 21st Century](#)**

This well-known recent book examines the transformation that is happening in the post-9/11 world. Inspired by the incorrect but widely held view among early European explorers (who thought the world was flat), Friedman argues that the world is being flattened by a number of advances in computing and communications technology. The book is built around 10 so-called flattening ideas, wherein these ideas collectively amount to a paradigm shift in which the playing field is being leveled for all world nations. Examples of flatteners include various advancement in computing, software, the economic model behind software (e.g. free and open source software), broadband and wireless communications.

- **Sam Williams, [Free as in Freedom](#)**

This book describes the origins of the Free Software Movement and presents the "biography" of its founder, Richard Stallman, the originator of many of the core ideas of the free and (some would argue) open source movement. In many ways, it is the authoritative reference for those who want to understand the origins and implications of the free software movement and its, to some, surprising success.

- **Eric S. Raymond, [The Cathedral and the Bazaar](#)**

This book presents two alternatives for the software movement. In one approach, the cathedral, big software applications are developed and maintained by programmers within a company. An alternative is the bazaar, where individuals and grass-roots organizations build software and give it away for free. It's an excellent read for those who want to understand the distinction between commercial software development (e.g. Microsoft Office, Adobe Photoshop, and others) and so-called open-source software development (Mozilla Firefox, OpenOffice, and the Linux operating system).

- **Simon Singh, [The Code Book](#)**

The Code Book presents an interesting view of computing history by focusing on cryptography and cryptanalysis. This engaging history traces cryptosystems back to Mary, Queen of Scots, who used encryption to exchange messages when in confinement, to the invention of Public Key Encryption, which forms the basis for secure web access (the *https* seen on a web page address) and messaging used on today's Internet. This book allows students to learn something about algorithms (a major building block of computer science) without having to understand programming. Most of the examples are shown visually with excellent supporting prose.

Schedule

Most courses covering the history of computing focus on the 18th century and beyond. We believe it is appropriate to include some foundational material from the history of mathematics toward the beginning of the course, which turns out to be indispensable for modern computing.

Please note that all assignments, papers, and quiz dates are now announced on the course's Blackboard instance.

Week and Dates	Topics/Readings
1	Arithmetic, Numerical Notation, Writing Systems, Algebra (~35,000 BC to 1654 AD) Syllabus (presented by George Thiruvathukal on first day of class, Tuesday) Writing Policies/Procedures (presented by Chris Grubbs on Thursday) Reading: Ifrah 3-9, 64-68

2	Early Calculating Devices Reading: Ifrah 110-129
3	Short Films and Discussion Group activities
4	Analytical Engine and Charles Babbage/Ada Lovelace (1822) Reading: Ifrah 189-201, Rheingold 25-32
5	Information Age Reading: Rheingold 115-131
6	Herman Hollerith Reading: Ifrah 179-188, Rheingold 41-44
7	Alan Turing Film Reading: Rheingold 45-66
8	Early Stored Program Computers and John von Neumann Reading: Rheingold 67-98, Ceruzzi 12-24
9	Transistors and Integrated Circuits Reading: Ceruzzi 182-198
10	Mainframes and Microcomputers Reading: Ceruzzi 207-241
11	Personal Computing and Office Automation (1972-1985) Reading: Ceruzzi 243-280
12	Cybernetics and Norbert Wiener (new material) Reading: Rheingold 99-114
13	Cryptography (new material)
14	World Wide Web (new material) "As we may think" by Vannevar Bush, http://www.w3.org/History/1945/vbush/vbush.shtml Reading: Rheingold 205-231
15	Modern Computing (Quantum Computing, etc.)
Finals	Final Examination at 9:00 a.m. (Please note the time!)

Assessment, based on the expert judgment of the faculty member teaching the course, includes evaluation of student knowledge and skill as demonstrated in at least three of the following student learning performances.

Attendance Policy

Attendance is necessary for your success in this class. In particular and as a general rule, you should attend when there are scheduled films, discussion assignments, and quizzes. Failure to attend when there is a scheduled discussion group activity or quiz will result in a zero for that activity. The only exception is when you have notified me of your absence in advance. In the case of quizzes, the only

acceptable reason for absence is a medical or emergency, which must be appropriately documented with evidence furnished to the instructor. In all cases, if you are unable to send e-mail, you should contact the CS department secretary at 312.915.7999 and leave a message. Please be sure to leave your name, a contact number, and make it clear that you are a student in COMP 111.

Late Work Policy

We will not accept any late papers this semester. Because we give you a full 6-8 weeks to complete each paper, you will have more than enough time. In the event you do turn in a paper late, it is subject to at least one full letter grade deduction. You are strongly encouraged to get started early. To ensure your success, we are going to ask that everyone furnish an outline and bibliography 3 weeks before the scheduled due date of each paper.

Quizzes (2-3; one possible take-home quiz, 40%)

- demonstrating historical knowledge of forces of continuity and change
- demonstrating knowledge of events, places, people, institutions
- demonstrating awareness of changing values and methods of interpretation

Writing projects (50%)

Because writing plays a crucial role in computing your grade, we provide a separate Writing Policies document, which will be covered in the first week of classes.

- assessment of sources
- use of citations as an ethical obligation
- research including thesis development, location of sources, assessment of evidence, exposition/argumentation,
- use of evidence and documentation
- clarity and accuracy of exposition

Class discussion (including small groups) (20%)

- demonstrating historical knowledge
- demonstrating the critical evaluation of primary source documents in terms of their purpose, audience,
- historical context, assumptions, and place in the development of historical understanding.
- generating questions, opinions, theories of interpretation
- appraising interpretations based on evidence, personal philosophy, and historical perspective
- evaluating strengths and weaknesses of various points of view

Grading Scale

The following grading scale will be used in Spring 2007.

%	grade
93-100	A
90-92	A-
87-89	B+
83-86	B
80-82	B-
77-79	C+
73-76	C

70-72	C-
66-69	D+
63-66	D
60-62	D-
<= 59	F

Please note that while this is the official scale to be used in the course, it is my policy to give you the *better* of two possible grades when you are in a borderline situation. For example, 92.1% would be bumped to an A automatically. I will also bump your letter grade upwards in cases where you have been exceptionally good when it comes to participation or show other evidence of greatness (e.g. a top quiz score or an exceptional paper).

Academic Integrity Policy

We will follow the policy from History 101's syllabus.

Plagiarism is presenting the words or ideas of another author as if your own. If you consult some books or look at web sites, cite them fully and properly. If you use the words of others, put quotation marks around them (or use a block quote) and cite your source. In case you have questions about what plagiarism is, we define it as follows:

You plagiarize when, intentionally or not, you use someone else's words or ideas but fail to credit that person. You plagiarize even when you do credit the author but use his exact words without so indicating with quotation marks or block indentation. You also plagiarize when you use words so close to those in your source, that if your work were placed next to the source, it would be obvious that you could not have written what you did without the sources at your elbow. Inadvertent plagiarism (incorrectly or insufficiently cited material) will result in a 0 (zero) on the assignment. Deliberate or repeated plagiarism will result in a grade of F for the course and a letter sent to the dean to be placed in your permanent file (this is in accord with university policy). If you have questions about this, please ask!

Beginning this term, we will be using the turnitin.com software. I will be discussing details about this software within the first 2 weeks of class and how you can use it to check your own papers for plagiarism and other possible problems.

Related Courses

- York University, STS 3700B, <http://www.yorku.ca/sasit/sts/sts3700b/syllabus.html>
- Stanford/Berlin University special course on History of Computing, <http://www.inf.fu-berlin.de/lehre/SS01/hc/>
- Computers in our World at Princeton University, <http://www.cs.princeton.edu/courses/archive/fall05/cos109/>
- American University Computing History Museum and Dr. Tim Bergin's History of Computing course, <http://www.computinghistorymuseum.org/>