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History of Computing

George K. Thiruvathukal
Loyola University Chicago, gkt@cs.luc.edu

David B. Dennis
Loyola University Chicago, dennis@luc.edu

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COMP 111 Syllabus: History of Computing at Loyola University Chicago

George K. Thiruvathukal¹ and David Dennis¹

¹Loyola University Chicago

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Abstract

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.

1 Important Info

Instructor [George K. Thiruvathukal](#), Department of Computer Science, Loyola University Chicago

Co-Instructor [David B. Dennis](#), Department of History, Loyola University Chicago

Teaching Assistant Nieky Allen, dallen4@luc.edu

Class Meeting Times Monday/Wednesday/Friday from 12:35PM-1:25PM

Class Location QLSB, Room 412 and online in Slack (see below)

Office Hours TBD by appointment (recommended) in Doyle 301 (Dr. Thiruvathukal's office at LSC)

E-mail gkt@cs.luc.edu

Google Collaboration thiruvathukal@gmail.com

Box Folder luc.box.com/v/comp111-wi (requires sign-in with Loyola user ID)

Online Slack Discussion Group luc-hoc.slack.com (join with your Loyola e-mail)

2 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.

3 Readings

This course will not rely upon a formal textbook. Instead a collection of books and articles are 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 (Annals of the History of Computing). 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.

3.1 Background Reading

While not required, the core narrative of the course is covered *in depth* in the following books.

- **Martin Campbell-Kelly, et. al., *Computer: A History of the Information Machine*** (Available Online) This is a solid survey of the evolution of computing, mainly from the 19th century on. It pays attention to the developments of business and office "human computing" and then traces the development of machine technologies through the internet and mobile revolutions.

This book is available in electronic format to all Loyola students and faculty through a library subscription to ProQuest eBooks. The online reading interface is effective, allowing you to read and even copy and paste. You should all be able to access it directly through the above link. Just add LUC

ID/pass. You might need to indicate that you are "checking out" the book as you read it. I assume this will not block others, but let's see.

- **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. (Selections will also be available online.)
- **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. [PDF version here.](#)

3.2 Supplemental Readings

- **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).
- **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).
- **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.

- **HOC YouTube Playlist** Here is an *evolving playlist of YouTube videos on the History of Computing*. Many of these documentaries and lectures are invaluable. You may also make recommendations or additions. [If you can find "replacements" for those deleted (titles still appear when clicked), that would also be appreciated.]

4 Tentative 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.

Week 1: Arithmetic, Numerical Notation, Writing Systems, Algebra

- Syllabus, Writing Policies/Procedures
- Reading: Ifrah 3-9, 64-68

Week 2: Early Calculating Devices

- Early Calculating Devices
- Reading: Ifrah 110-129, Campbell-Kelly xi-xv,

Week 3: Pre-Writing Activities

- Short Films
- Pre-writing Activities
- Paper topic brainstorming (forum or wiki)
- Lightning talks on prospective topics in class (to get "public" feedback)

Week 4: Charles Babbage and Ada Lovelace

- Analytical Engine and Charles Babbage/Ada Lovelace (1822)
- Reading: Ifrah 189-201, Campbell-Kelly 3-13, 41-46, Rheingold 25-32 (Chapter 2)

Week 5: Information Age

- Information Age
- Reading: Rheingold 115-131 (Chapter 6)
- Paper: List of References and Outline due

Week 6: Hollerith, The Census and The Mechanical Office

- Herman Hollerith
- Reading: Ifrah 179-188, Campbell-Kelly 15-40, Rheingold 41-44 (Chapter 2)

Week 7: Stored Program Computing

- Early Stored Program Computers and John von Neumann
- Reading: Rheingold 67-98 (Chapter 4), Campbell-Kelly 46-96, Ceruzzi 12-24
- Paper: First Draft due

Week 8: Transistors and Integrated Circuits

- Transistors and Integrated Circuits
- Reading: Ceruzzi 182-198, Campbell-Kelly 98-117

Week 9: Peer Review

- Transistorized! Film
- Paper: Peer reviews due (will use a proper peer-reviewing tool with support for anonymous ratings and written review)

Week 10: Mainframes and Microcomputers

- Mainframes and Microcomputers
- Reading: Ceruzzi 207-241, Campbell-Kelly 119-165

Week 11: Personal Computing Era

- Personal Computing and Office Automation (1972-1985)
- Reading: Ceruzzi 243-280, Campbell-Kelly 167-251
- Pirates of Silicon Valley Film

Week 12: Video Games

- Reading: Codename Revolution: The Nintendo Wii Platform, Campbell-Kelly 253-274

Week 13: Google and The Internets

- World Wide Web
- “As we may think” by Vannevar Bush, <http://www.w3.org/History/1945/vbush/vbush.shtml>
- Reading: Rheingold 205-231 (Chapter 10), Campbell-Kelly 275-305. Also see various videos on YouTube list above.

Week 14: Machine Learning and AI

- See this general *introductory lecture by Christopher Bishop to the Royal Institution*, and various videos about AI, Machine Learning, and Deep Learning on the YouTube playlist above.
- Readings: *Free as in Freedom*

Week 15: Quantum Computing and The Future of Computing

- See this [introduction to Quantum Computing by Seth Lloyd at MIT](#), and other lectures by him on the YouTube playlist above.
- Modern Computing (Video Gaming, Quantum Computing, etc.)
- Paper: In-class presentation/video due

Finals Week

The Final Slot will be used for student presentations. There is no exam during this period, and I will take great care to ensure that there are no quizzes in the two weeks prior to finals week.

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.

4.1 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.

4.2 Late Work Policy

We will not accept any late papers or presentations . Because we give you a full 6-8 weeks to complete each paper/presentation, 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 may ask that everyone furnish an outline and bibliography 3 weeks before the scheduled due date.

4.2.1 Grading Breakdown

- 80% - Weekly Writing Requirements - There are weekly writing obligations in this course. You will be asked to write article/book summaries, selected from a list of research topics (to be distributed separately from the syllabus). Some writing assignments may be given as in-class quizzes, based on the lecture material.
- 10% - Participation: There will be multiple ways to participate. The two most common ways will be to be actively engaged in the class (making presentations) and participating in the class Slack channel.
- 10% - Portfolio/Synthesis: A final presentation or paper is required to synthesize what you have learned from all of the sources you researched. Because you will have done substantial writing in each week leading up to the final week of classes, we strongly encourage a Pecha Kucha or Lightning presentation about your topic with an in-class and/or multimedia presentation (e.g. a YouTube video).

Discussion assignments, including group discussions and movie discussions, and class participation are vital to your success in the class.

4.3 Grading Scale

The following grading scale will be used:

%	grade	%	grade	%	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). Extra credit increases your final grade by 1% for each item completed (thus, it helps in borderline, or close-to-borderline situations). There will be various extra credit opportunities throughout the semester, and you will usually be required to write a paper about the event.

5 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 using the MLA (Modern Language Association) guidelines. 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!

The instructor may use the turnitin.com software to check papers for plagiarism and other possible problems. Historically, however, we are able to catch plagiarism using simpler methods.

The above schedule, policies, and assignments, in this course are subject to change in the event of extenuating circumstances. The grading scale, however, will not be changed, unless it would increase your grade.