INLS 465 – Understanding Information Technology for Managing Digital Collections
[Last Updated: 2024-01-10]
Spring 2024
Meeting Time: Wednesdays at 11:15-2:00pm
Location: Manning 304
Instructor: Cal Lee
Office Hours: Wednesday, 2-3pm, or by appointment

COURSE DESCRIPTION

The fundamental motivation for this course is that anyone responsible for digital collections will have to understand and be conversant in various aspects of the associated information technologies, in order to evaluate the work of developers, delegate tasks, write appropriate requests for proposals (RFPs), and establish reasonable management and preservation policies.

COURSE OBJECTIVES

Upon completion of this course, you should be able to:

- Assess many of the opportunities and challenges associated with digital information systems that you have not seen before and explain them to those who have less technical background than you
- Actively contribute to discussions about design, maintenance and changes to the information systems that support digital collections for which you are responsible
- Read and understand the information technology trade press, recognizing opportunities and strategic implications for the management of digital collections
- Contribute substantive recommendations for policies related to the management of digital collections

COURSE EXPECTATIONS

- Complete readings before each class session. For tips on reading strategically: "How to Read a Book" by Paul Edwards - https://pne.people.si.umich.edu/PDF/howtoread.pdf
- Written work should be of high quality. If you have concerns about writing, address them early and often.
  - UNC Writing Center in on the lower level of the Student and Academic Services Building North (SASB), with a satellite office in Greenlaw Hall, Room 221. - https://writingcenter.unc.edu
  - Most importantly, your peers.
- Come to class on time.
- Participate in discussions.
- Demonstrate that you have read the material, understood and synthesized it.
- Practice "respectful and informed ignorance." Will Rogers said, "Everybody is ignorant, only on different subjects." This class will be most effective if everyone feels comfortable asking questions, so respect the questions of others. Bring to class your own informed questions about the week's materials (i.e. be able to convey how you've tried to understand the issues and what still remains unclear to you).
- Your comments should reflect mutual respect and should not attack individuals (including authors). Remember that critical reasoning is not the same as simply criticizing. Whenever you encounter a reading or personal comments, consider adopting the Wikipedia principle of assuming good faith - https://en.wikipedia.org/wiki/Wikipedia:Assume_good_faith

Special Needs: If you feel that you may need an accommodation for a disability or have any other special need, please make an appointment to discuss this with me. I will best be able to address special circumstances if I know about them early in the semester.

Student Support

Please feel free to reach out to me if you’re having difficulty with the material or there are outside circumstances impeding your ability to learn (for example, housing insecurity, food insecurity, emotional insecurity, or are in need of physical or
Mental Health: CAPS is strongly committed to addressing the mental health needs of a diverse student body through timely access to consultation and connection to clinically appropriate services, whether for short or long-term needs. Go to their website: [https://caps.unc.edu](https://caps.unc.edu)

Links to an external site, or visit their facilities on the third floor of the Campus Health Services building for a walk-in evaluation to learn more. (source: Student Safety and Wellness Proposal for EPC, Sep 2018)

Accommodations: The University of North Carolina at Chapel Hill facilitates the implementation of reasonable accommodations, including resources and services, for students with disabilities, chronic medical conditions, a temporary disability, or pregnancy complications resulting in barriers to fully accessing University courses, programs, and activities. Accommodations are determined through the Office of Accessibility Resources and Service (ARS) for individuals with documented qualifying disabilities in accordance with applicable state and federal laws. See the ARS Website for contact information: [https://ars.unc.edu](https://ars.unc.edu) or email ars@unc.edu.

Title IX: Any student who is impacted by discrimination, harassment, interpersonal (relationship) violence, sexual violence, sexual exploitation, or stalking is encouraged to seek resources on campus or in the community. Please contact the Director of Title IX Compliance (Adrienne Allison – Adrienne.allison@unc.edu), Report and Response Coordinators in the Equal Opportunity and Compliance Office (reportandresponse@unc.edu), Counseling and Psychological Services (confidential), or the Gender Violence Services Coordinators (gvsc@unc.edu; confidential) to discuss your specific needs. Additional resources are available at safe.unc.edu.

Using your Own Words and Attributing Others

It is very important that you both attribute your sources and avoid excessive use of quotes. Please read the document called "In your Own Words." Be aware of the University of North Carolina policy on plagiarism. Your written work must be original. Ask if you have any doubts about what this means.

ChatGPT and other Generative Artificial Intelligence (AI) can produce text, images, and other media. These tools can assist with brainstorming, finding information, and even reading and creating materials; however, they must be used appropriately and ethically, and you must understand their limitations. For this class, the guidelines for generative AI developed by the UNC Campus committee in the summer of 2023 will be in effect: Generative AI Usage Guide.

Links to an external site All cases of plagiarism (unattributed quotation or paraphrasing) of anyone else's work, whether from someone else's answers to homework or from published materials, will be officially reported and dealt with according to UNC policies (Instrument of Student Judicial Governance, Section II.B.1. and III.D.2, [http://instrument.unc.edu](http://instrument.unc.edu)).

Honor Code

"The University of North Carolina at Chapel Hill has had a student-led honor system for over 100 years. Academic integrity is at the heart of Carolina and we all are responsible for upholding the ideals of honor and integrity. The student-led Honor System is responsible for adjudicating any suspected violations of the Honor Code and all suspected instances of academic dishonesty will be reported to the Honor System. Information, including your responsibilities as a student is outlined in the Instrument of Student Judicial Governance. Your full participation and observance of the Honor Code is expected."

COURSE REQUIREMENTS

1. Complete required readings and participate in class discussions (most in person but some online).
2. Submit 10 of the 12 Paper Assignments (skip two of them) to the Canvas Assignments area. Each paper should be uploaded by **5pm on Thursday of the week it is assigned.**
3. Final Exam - **4pm on Thursday, May 2**

EVALUATION
Participation in class discussions and exercises: 20%

Weekly Assignments: 50% (5% x 10 assignments)

Course Exam: 30%

The most important measures of your performance in this and all other classes at SILS will be your ability to engage in challenging materials with your fellow students; your reputation for insights and professionalism among your peers and with your instructor; your integration of course material with the other things you are learning both inside and outside the classroom; and your ability to apply what you’ve learned in your future career. However, the conventions of academia dictate that I also assign labels (called grades) to your work on assignments and for the course as a whole.

Based on UNC Registrar Policy for graduate-level courses (http://regweb.unc.edu/resources/rpm24.php), both assignment and semester grades will be H, P, L or F. Few students will obtain an "H," which signifies an exceptionally high level of performance (higher than an "A" in an A-F systems). The following is a more detailed breakdown:

H Superior work: complete command of subject, unusual depth, great creativity or originality
P+ Above average performance: solid work somewhat beyond what was required and good command of the material
P Satisfactory performance that meets course requirements (expected to be the median grade of all students in the course)
P- Acceptable work in need of improvement
L Unacceptable graduate performance: substandard in significant ways
F Performance that is seriously deficient and unworthy of graduate credit

According to UNC Registrar Policy, undergraduate grades are based on the following definitions:

A Mastery of course content at the highest level of attainment that can reasonably be expected of students at a given stage of development. The A grade states clearly that the students have shown such outstanding promise in the aspect of the discipline under study that he/she may be strongly encouraged to continue.
B Strong performance demonstrating a high level of attainment for a student at a given stage of development. The B grade states that the student has shown solid promise in the aspect of the discipline under study.
C A totally acceptable performance demonstrating an adequate level of attainment for a student at a given stage of development. The C grade states that, while not yet showing unusual promise, the student may continue to study in the discipline with reasonable hope of intellectual development.
D A marginal performance in the required exercises demonstrating a minimal passing level of attainment. A student has given no evidence of prospective growth in the discipline; an accumulation of D grades should be taken to mean that the student would be well advised not to continue in the academic field.
F For whatever reason, an unacceptable performance. The F grade indicates that the student's performance in the required exercises has revealed almost no understanding of the course content. A grade of F should warrant an advisor's questioning whether the student may suitably register for further study in the discipline before remedial work is undertaken.

AB Absent from final examination, but could have passed if exam taken. This is a temporary grade that converts to an F* after the last day of class for the next regular semester unless the student makes up the exam.
FA Failed and absent from exam. The FA grade is given when the undergraduate student did not attend the exam, and could not pass the course regardless of performance on the exam. This would be appropriate for a student that never attended the course or has excessive absences in the course, as well as missing the exam.
IN Work incomplete. This is a temporary grade that converts to F* at the end of eight weeks into the next semester unless the student makes up the incomplete work.
W Withdrew passing. Entered when a student drops after the six-week drop period.

COURSE READINGS
Required Text:


SILS Reserves: Copies of the following books are available from the SILS Library on the first floor of Manning Hall (behind the SILS Library help desk):


For the weekly readings, the following labels indicate where specific course readings can be located:

**B** = Book for purchase

**R** = Reserves at SILS Library in Manning Hall

**C** = Canvas, where copies of some readings are available (under Files > Readings)
**Online** through UNC license. NOTE: Accessing these materials can require you either to use a computer with a UNC IP address or visit the associated sites through a UNC proxy server. See: Off-Campus Access, [http://proxy.lib.unc.edu/setupinfo.html](http://proxy.lib.unc.edu/setupinfo.html). If you're off campus and want to enter a given page through a UNC proxy server, you can use the following bookmarklet: javascript:location.href='http://libproxy.lib.unc.edu/login?url='+location.href

**Publicly accessible Web**

Other resources that you might find interesting:

- Computer Science Unplugged, [http://csunplugged.org/](http://csunplugged.org/) [developed for primary school, but also informative for adults
- Khan Academy, [https://www.khanacademy.org](https://www.khanacademy.org) - several relevant resources, including the classes "Code.org," "Computers and the Internet" and the first few units of "AP/College Computer Science Principles/College Computer Science Principles."

**Tools to Support Curation of Digital Collections** - This class is not focused on specific applications. However, it is often helpful to know what software is available to support various activities that relate to the topics of the course. For a directory of tools, see: [http://coptr.digipres.org/](http://coptr.digipres.org/)

# Part 1 - Nature and Characteristics of Contemporary Information Technologies

**Session 1 (January 10) - Course Overview; Nature and Characteristics of Contemporary Information Technologies**

**Session 2 (January 17) - Technology - Definition, Characteristics and Social Dynamics**

- Unexpected consequences
- Importance of social context and limits of technological determinism
- Values/norms and practices being embedded in technology
- Why we all need to care about the technology that supports and enacts our work

**Focal Readings:**


**Other Related Readings**

**Session 3 (January 24) - Technological Components: Historical Origins and Interoperability**

- Evolution of ICTs:
  - From purpose-built computers to mainframes, time sharing, minicomputers, personal computers, client-server, mobile devices
Dominant storage technologies from given eras

- History of the Internet
- Interoperability
- Tight vs. loose coupling
- Concept of interface (including API)
- Concept of open systems
- Encapsulation
- Portability
- Forward and backward compatibility

**Focal Reading:**


**Other Related Readings**

**Session 4 (January 31) - General Overview of Computer Architecture**

- Main hardware and software components that make computers work
- Role and relationships of main components
- Three main resource types: processing, storage, movement of data

**Focal Readings:**


**Other Related Readings**

**Session 5 (February 7) - How to Read a Bit - Storage, Signal Detection and the Logic of Bits**

- Operation and characteristics of media (magnetic and optical)
- Different types of storage
- Signal (and noise) processing
- Basic operations and logic of bits
- Inevitability of bit-level data corruption

**Focal Readings:**


Other Related Readings

Session 6 (February 14) - Representation Information (Part 1)

- Compression
- Data structures and data types
- Databases
- Encryption
- File formats
- Images (vector and raster)
- Digital audio

Focal Readings:


Other Related Readings

Session 7 (February 21) - Representation Information (Part 2) - Text Encoding and Structure

- Fonts
- Optical character recognition (OCR)
- Structured, unstructured and semi-structured data
- Markup languages (including XML)
- Serialization

Focal Readings:

Other Related Readings

Session 8 (February 28) - Identifiers for Digital Objects

- Commonly used identifiers (e.g. file names, URLs)
- Promising approaches for persistent identifiers
- Differences between local and global identifiers

Focal Readings:


Other Related Readings

Session 9 (March 6) - Operating Systems and File Systems

- What the OS does
- Major ways in which software can depend upon the OS

Focal Readings:


Other Related Readings

SPRING BREAK - March 11-15
Session 10 (March 20) - Moving Bits around - Input/Output and Networks

- Input/Output mechanisms
- Data communications
- Layers (network stack)
- Types of networks
- Internet protocols
- Local area network (LAN) and wide area network (WAN)
- Firewalls

Focal Readings:


Other Related Readings

Session 11 (March 27) - Making and Running Software - Essential Components

- Programming - fundamentals of what programming languages do and some of their common elements
- Roles and differences between source code, assembly code, object code, compilers, interpreters, machine instructions
- Viruses

Focal Readings:


Other Related Readings

Session 12 (April 3) - Industry Patterns, Players, Relationships and Trends

- Obsolescence
- Network Effects
- Lockin, legacy systems and angry orphans
Part 2 - Strategies and Approaches

Session 13 (April 10) - Organizational and Conceptual Approaches

- Taking complexity, change and robustness seriously
- Change management
- Models and modeling

Focal Readings:


Other Related Readings

Session 14 (April 17) - Architectural and System Design Approaches

- Configuration management
- Modularity and decomposability
- Standards
- Being indirect on purpose - abstraction and virtualization
- Gateways
- Reengineering
- Code Reuse
- Middleware

Focal Readings:


C - Seacord, Robert, Daniel Plakosh, and Grace Lewis. "The Legacy Crisis," "Understanding the Legacy System," and

Other Related Readings

Sessions 15 (April 24) - Synthesis and Summary of Course Concepts

Focal Reading:


Other Related Readings

Other Related Readings by Session:

Session 2 - Technology - Definition, Characteristics and Social Dynamics


Session 3 - Technological Components: Historical Origins and Interoperability


W - Apple History Library. 512 Pixels. https://512pixels.net/apple-history/

W - Babbage Difference Engine in Motion. https://www.youtube.com/watch?v=jiRgdaknJCg


Metadata Basics. Dublin Core Metadata Initiative. http://dublincore.org/metadata-basics/ [See especially the four levels of interoperability.]


Video about IBM's Role in Hidden Figures. [https://www.facebook.com/IBM/videos/1238005939623019/]

Video Game History Foundation. [https://gamehistory.org/]

Session 4 - General Overview of Computer Architecture


Session 5 - How to Read a Bit - Storage, Signal Detection and the Logic of Bits


Carrier, Brian. *Alternate Data Storage Forensics*. Burlington, MA: Syngress, 2007. [Includes extraction of data from handheld devices, e-mail, routers, CD, DVD and MP3 files]


Session 6 - Representation Information (Part 1)


Session 7 - Representation Information (Part 2) - Text Encoding and Structure


W - “The Top Ten Hidden Data Threats.” ManTech International. [http://docdet.mantech.com/docdet/Presskit/The%20Top%20Ten%20Hidden%20Data%20Threats.pdf](http://docdet.mantech.com/docdet/Presskit/The%20Top%20Ten%20Hidden%20Data%20Threats.pdf) [Illustrates common cases of accidentally disclosing "hidden data" within files]


**Session 8 - Identifiers for Digital Objects**

O - Buneman, Peter, Susan Davidson, and James Frew. "Why Data Citation is a Computational Problem." *Communications of the ACM* 59, no. 9 (2016): 50-57.


W - Rosenberg, Scott. "Will Deep Links Ever Truly be Deep?" *Backchannel*. April 7,


### Session 9 - Operating Systems and File Systems


Session 10 - Moving Bits around - Input/Output and Networks


Session 11 - Making and Running Software - Essential Components


W - Cook, Timothy. "A Regular Expression Search Primer for Forensic Analysts." SANS Institute,


Montfort, Nick, Patsy Baudoin, John Bell, Ian Bogost, Jeremy Douglass, Mark C. Marino, Michael Mateas, Casey Reas, Mark Sample, and Noah Vawter. *10 PRINT CHR$(205.5+RND(1)):GOTO 10*. Cambridge, MA: MIT Press, 2013. [A series of essays about a one-line Commodore 64 BASIC program.]


**Session 12 - Industry Patterns, Players, Relationships and Trends**


JISC Technology and Standards Watch. http://www.jisc.ac.uk/index.cfm?name=techwatch_home


### Session 13 - Organizational and Conceptual Approaches


Session 14 - Architectural and System Design Approaches


**Sessions 17 and 18**


I would like to express my gratitude to Jean-François Blanchette, Kelly Garrett, and Paul Resnick for making the materials from their courses (IS 270: Introduction to Information Technology at UCLA, and SI 540: Understanding Networked Computing at the University of Michigan) available. They have been extremely useful to me in preparation of this course.