

David M. Keil, Framingham State University

CSCI 120 Introduction to Information Technology

Introduction

1. What this course offers
2. What is information technology?
3. How this course will deliver

Invitation

- Central questions of investigation:
 - *What do you need to know about information technology, as a professional and a citizen?*
 - How can users create their own computing and social environments?
- We will investigate hardware and software, and how to use browsers, word processors, spreadsheets, and databases to explore our world and support our decisions

1. What this course offers

- A place to ask questions about information technology
- An environment to discuss how IT will affect you and how you will use it to change the world
- Ways to solve problems
- Ways to *learn* to do things with IT that can't be done today

Why take this course?

- We all use IT as workers and citizens
- Learn about fundamentals that will matter
- *Goal*: Fluency with IT
 - *Skills* (e.g., create a style in word processor)
 - *Concepts* (e.g., reuse of information; abstract modeling; principles of applications, operating systems, and hardware)
 - *Capabilities* (e.g., to find and correct system faults; to anticipate technical change)

I assume that you like ...

- A chance to be *active* and *interact*
- *Finding out* about the world
- Meeting *challenges*
- Competence and mastery
- Reaching new levels of complexity

(A. Kohn, 1999)

Self-introductions

- I am a Computer Science faculty member whose research is in models of computing
- Please tell us
 - who you are and what your interests are
 - your major
 - what you hope for in this class
 - what you are wondering about
 - about athletic, work, or family activities that matter to you

Users co-create their computing environments

- *Named styles* (T1) package text formats for reuse
- *Formulas* (T2) support calculation that may be repeated or copied
- A *database design* (T3) gives you a framework to organize data

Co-creating our environments

- *Buying a device* (T4) means choosing and combining hardware features
- *Online social network* users (T5) shape their interfaces with other users
- *Program design* (T6) may shape how we and our customers share information and requests via web sites
- We assert *rights and rules* (T7) to regulate how people and companies interact via the Internet

Example concept: *tables*

- In topic 1, a table is a *formatting* tool for organizing information (e.g., course plan)
- In T2, a *spreadsheet* arranges data in a *grid* or *matrix*, sometimes with summary cells
- In T3, a *database table* uses *columns* to represent *attributes* of objects and *rows* to represent objects themselves

Course plan

1. Formatting text and creating graphics
2. Spreadsheets and decision support
3. Database management
4. Hardware and operating systems
5. Networks and the Internet
6. Problem solving and programming
7. IT and society

Summary

Course objectives, topics 1-3

1. Explain principles of operating systems and application software, including text formatting
2. Describe and apply principles of spreadsheet use
3. Describe the querying and design of databases in business environments

Course objectives, topics 4-7

4. Explain how a computer system operates and represents information
5. Describe networked and Internet computing and how it is used in business, personal interaction, and education
6. Explain and apply concepts of computing-system specification and design
7. Explain how the IT revolution has developed and how it raises new ethical and legal issues in several fields

Multi-topic objectives

- 0a Participate in written exercises throughout the semester
- 0b Solve problems as part of a team
- 0c Report back in the classroom
- 0d Summarize and reflect on the semester's work
- 0e Write a research proposal
- 0f Communicate and support an idea in a formatted, well-designed report
- 0g Explain metadata
- 0h Reflect on reading of text material

Topic 1: Formatting text and graphics

- What are the best features of MS Word and PowerPoint?
- What are the main principles for making text formatting efficient?

Topic 2: Spreadsheets

- What are the main principles of using spreadsheets?
- What techniques make spreadsheet use easier?

Topic 3: Database management

- What is worth knowing about databases, for non-database professionals?
- What is the principle for organizing data in databases?

Topic 4: Hardware and operating systems

- What unites all information storage?
- Does a computer work like a brain?
- Why does my phone boot quickly and my laptop boot slowly?

Topic 5: Networks and the Internet

- Why are networks often down?
- Why are they vulnerable to hacking?
- What principles enable communication worldwide?
- How can I connect better online with my friends?

Topic 6: Problem solving and programming

- Why does almost everyone either hate or love programming?
- Why does software not work?
- What steps and what tools enable building computer solutions efficiently?

Topic 7: IT and society

- How will IT affect me and people I know, in our personal and work lives?
- How does IT affect the rate of social change?
- Why is the risk to our personal data and our privacy rising?

Pretest and assignment

- Please take the pretest
- I'd like to know what you know now and after the course
- Please do the introductory assignment
- Every assignment has an ungraded question asking what main ideas you took away from a topic and what is unclear to you

Group exercise

- Please form groups of two or three and discuss the following:
“What do I need to know about IT?”
- Brainstorm and share answers to arrive at one or two group answers
- One group member write and post the group's conclusions, with names of group members
- Another group member report for the group next day of class
- *Also:* divide objectives per exercise sheet

2. What is information technology?

- What forms of computer technology have you used?
- What is *information*?
- Is *all* technology IT?

Show a card for (a) to (e)

Information technology is always

- (a) a department
- (b) tools and devices for processing data
- (c) hardware
- (d) software
- (e) silicon based

Defining “information technology”

- *Data* takes the form of sequences of symbols
- *Information*:
 - Data with meaning (this course)
 - Processed data (Evans et al)
 - “The words, numbers and graphics used as the basis for human actions and decisions” (Parsons, Oja)
 - Quantity of information: amount of *surprise*

Information technology

- *Technology*: (innovative) tools
- *IT*: Hardware and software for processing digital data (this course)
- “The set of techniques used in information handling and retrieval of information automatically” (Evans et al)
- “Application of appropriate technologies to the organization, manipulation, and distribution of information by computers and telecommunications” (G. Stamatellos)

Features of IT

- *Relentless changes* and paradigm shifts
- *Ubiquity*: Computation becomes part of every task and device
- *Exponential rise* in computing power
- *Connectivity* of all people and devices
- *Convergence* of media (wireless Internet, cell phones, media players)

Computer literacy / IT fluency

- Understanding of the capabilities and limitations of IT
- Knowledge of how to use computers and IT
- Readiness to learn future technologies
- Ability to handle risks (e.g., faults, security, and privacy issues)
- *Computer literacy* is also a foundation for *fluency with IT*, the broader objective of this course

Fluency with IT

- *Skills* in using applications
 - Formatting data
 - Information management: storage, retrieval
 - Communication
- *Concepts*: e.g., digital vs. analog
- *Capabilities*: e.g., problem solving
- *Scalability*: being ready to extend knowledge
- *Problem solving*: Known information; desired information; method of transformation

New ways to think about IT

- IT doesn't just automate *manual* tasks, but lets us leverage technical capabilities to *reuse effort*
- Examples (all are *metadata*):
 - *Named styles* in MS Word, HTML
 - *Hyperlinks* and *shortcuts* to web sites, files, folders
 - Writing and copying *formulas* in spreadsheets
 - *Headers/footers* in docs and slide shows
 - *Computer programs*

IT and careers

IT is part of:

- retailing
- production
- the arts
- games
- education
- law enforcement
- practice of law
- agriculture
- automobile
- medicine
- science
- sports
- nanotechnology
- psychology

Careers *in* IT

- 3 of the 17 U.S. occupations projected to grow fastest, 2006-2016:
 - Network system analysts
 - Application software engineers
 - Forensic science technicians
- Jobs that will *not* be offshored:
 - Customer-interface intensive jobs
 - Project-enabling jobs that require technical skills
 - Information infrastructure jobs

Technology and globalization

- Emergence of a digital world
- Social implications of technology result from
 - cheap copiability
 - communications speed
 - connectivity
 - creativity tools
- Everyone needs to use analytical and algorithmic thinking, and debugging skills

Integrity of information

- Trace data source
- Store data once
- Calculate data wherever possible
- *Documents* assume integrity with *references*
- *Spreadsheets* do so with *formulas*
- Databases use rules such as, any fact appears *once* in a database

Abstraction in Intro to IT

- A big theme in the course, because computers manipulate abstract symbols
- “To abstract is to remove the basic concept, idea, or process from a situation” (L. Snyder)
- *Goal*: to identify the *relevant* facts
- *Related*: finding patterns and generalizations about them
- What is computing? (Instructor point of view: Computing is *either* transforming data to data, or else *interaction*.)

Analytical and critical thinking

- In 50 years, humans became 1.07 times faster, computers 21 million times faster (L. Snyder)
- *Analyze*: break apart; part of abstraction
- Need to assess one’s use of IT in order to extend or correct it
- Use of mathematics aids intuition
- Intuition has limited value with computers

Course themes and concepts

- silicon vs. neurons
- global control of formatting
- nonlinearity of text
- absolute vs. relative referencing
- linking vs. embedding
- metadata
- hierarchy
- storage/retrieval
- analytical thinking and abstraction

Theme: metadata (data about data)

- A kind of *abstraction; structural or descriptive*
- *Examples in life:* book titles, tables of contents, course name and descriptions
- *Examples in computing:*
 - *word processing:* styles, page headers
 - *spreadsheet:* formulas
 - *database:* table column headings
 - *smart phones:* contact lists, apps
 - *IT and society:* government collection of phone metadata has been in news

Languages discussed in IIT

<u>Topic</u>	<u>Kind of language</u>	<u>Example</u>
1	Application interface Markup	MS Word, PPT HTML
2	Formula (algebra)	Excel formulas
3	Query language	database queries
4	Machine	Pentium
5	Network protocol	HTTP, FTP, TCP/IP
6	Design Procedural	flowcharts, UML diag JavaScript

3. How the course will deliver

- *Classroom*
 - Presentations
 - Discussion
 - Group work
- *Written materials*
 - Slides
 - Textbook
 - Handouts
- *Exercises and assessment*
 - Objectives
 - Exercises
 - Multiple-choice quizzes
 - Problem-solving quizzes
 - Project
 - Research
 - Summary quiz

This course is an inquiry

- *FSU motto*: “Live to the truth”
- What does this mean? What is the truth?
- What does *truth* mean in software development and computer science?
- *Possible ways to the truth*:
 - proofs
 - our own experience, including experiments
 - discussion
 - authority of experts (with caution)

Course organization

- This course has seven *topics*; each with an *objective* and 3-5 *subtopics*
- Each subtopic has one or more *objectives*
- I label subtopic objectives *essential*; *priority*; or *challenge*
- A set of *problems* for each subtopic objective is available
- Exercises and quizzes focus on these

Classroom format

- Emphasis is on *inquiry, activity,* and *collaboration*
- *Slides and short presentations* summarize the content of the course
- We seek to create a *natural critical learning environment*
- *Your contribution and participation* matter

Guidelines

- Collaborative environment based on syllabus
- Full academic freedom
- Mutual respect and support
- Staying on topic
- One conversation
- Phone-free classroom
- Nondisruptive coming and going OK

Classroom discussion

- *Goal: everyone* participates without exception
- *Methods:*
 - All agree to prepare for class
 - I call on students at random with open-ended questions
- *Guarantee:* all answers are appreciated
- What are pros and cons of this method, for you?
- Can we agree to use it?

Preparing for class

- We learn by *discussing* and *solving problems* together
- Please get ready by looking at readings, slides, and problems *before* and *while* we discuss a topic
- Bring your questions to class!
- Turn in evidence of preparation (e.g., exercises) *each week* or *each class session*

Exercises

- *Exercises* consist of individual and group problem solving
- Each student solves problems from as many essential and priority outcomes as possible; I check off work received
- Before solving a problem on a quiz, solve one for that objective as an exercise
- Some exercises I evaluate for achievement of objectives

Due dates

- Exercises are due on the last day of a topic
- We'll have a quiz then too
- Week 7 is deadline for mid-semester assessment of all work
- Submit projects at mid-semester and near end; I give feedback so students may fill gaps and make corrections
- *You and your life* organize your time
- Half credit for very late exercises

Role of groups

- Assign objectives to group members for presentations
- Help each other with exercises
- Share comments on classroom exercises
- Participation by all in group work is one of our basic objectives in this course



Assessing objectives in class

- After doing exercises on a topic, you may show attainment of an outcome/objective by solving a quiz problem, in writing, in class
- More opportunities will be available for each outcome
- The main factor in success is attaining objectives and outcomes
- Other factors: evidence of preparation; contribution to everyone's learning

Scoring answers, not quizzes

- I score answers in a range of 0 to 6; 0 or 1 mean “not yet, try again”
- A successful solution usually reflects study and work on an exercise
- Scores on outcomes can only improve as you learn more
- Leaving a question blank for “I don’t know” often shows discernment

Exercises *before* quizzes

- Quizzes may need preparation
- Exercises are like pre-game practice
- Work together on exercises and use your course materials before quizzes
- Research shows that quiz success depends on *active study*, not on talent or luck

Integrity of quizzes

- All quizzes are *closed-book* because all questions and some answers are available publicly
- We are *all* responsible for integrity
 - Phones and laptops in bags
 - Silence
 - I sit at back of room
 - Some sessions use multiple versions
 - Talk to me if you see a problem

Six-week tally

- Master topics Intro to 3 by mid-semester
- Your ability to contribute will depend on that
- So will success on topics 3 to 7
- Mid-semester assessment:
 - Scores for objectives
 - Exercises and project work
 - Solutions presented in class
 - Documented group work
 - Preparation

Summary quizzes and final-exam day

- During the last week of classes, we'll have a *summary quiz* of multiple-choice questions and multi-topic problems
- On final exam day, students will present elements of their semester projects

I measure three essentials

- *Learning objectives* are measured by problem-solving quizzes, multiple-choice quizzes, and some exercises
- *Preparation*, measured by exercises and project *each week or each class session*
- *Contribution or participation*, measured by blackboard work and documented group work

Your contribution is essential

By mid-semester:

- Solve problems
- Ask questions
- Exchange problems and critique solutions
- Present your solutions twice at the blackboard or as demos
- Critique the reading
- Submit a preliminary version of the project

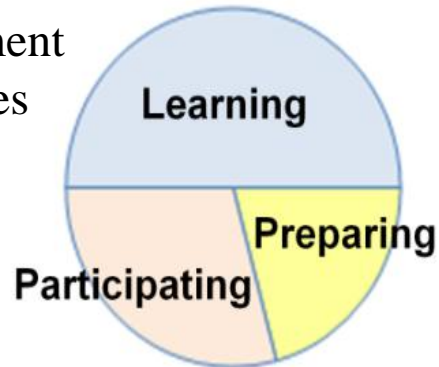
Scheduled student meetings and blackboard work

I'll schedule

- *3 meetings* with you to discuss the class; meetings with groups OK
- *3 times* for you to work at the blackboard or to present solutions on specific objectives

Assessment and grading

- *To measure:*
 - Individual achievement of learning objectives
 - Preparation for class sessions
 - Contribution to the learning of the class
- *Assumptions:* Learning is *active, shared and measurable*



Assessment of learning objectives

Assumptions:

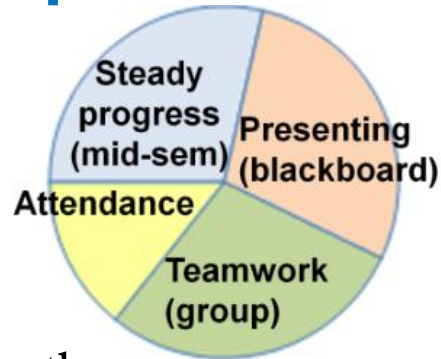
- Learning is measurable via objectives
- Some objectives matter more than others
- We learn by *summarizing* and *reflecting*



Measure of contribution and participation

We assume that learning happens by:

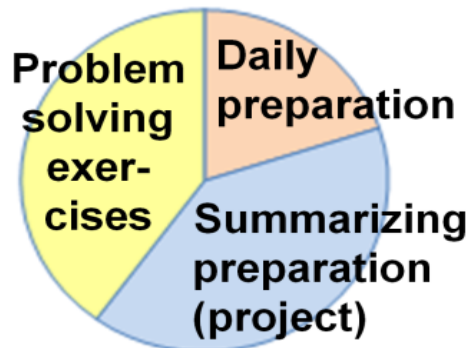
- Sharing inquiry
- Being present
- Solving problems together
- Activity throughout the semester



Measure of preparation

We assume that:

- *Solving problems (exercises) enables learning*
- *Classroom work requires preparation*
- *Summarizing exercises and preparation in a project helps learning last*



Breakdown of objectives

Topic	Priority		E + P	Challenge		
	Essential	exerc		total	exerc	
1	2	5	2	7	7	2
2	2	4	1	6	3	
3	1	4	1	5	3	
4	1	3		4	5	2
5	1	3	1	4	5	1
6	1	4		5	7	2
7	1	2		3	5	
	9	25	5	34	35	7

Suggested goal: attain at least five essential or priority objectives per week

Semester grading weights

<i>Learning</i>	Essential objectives	25	Quizzes
	Priority objectives	15	and
	Challenge objectives	10	exercises
<i>Preparation</i>	Summarizing learning	10	Summ quiz
	Daily preparation	5	Turn-in
	Topic problem solving	10	Exercises
<i>Participation</i>	Summarizing preparation	10	Project
	Steady progress	10	Mid-sem tally
	Presenting	10	Blackbrd work
	Teamwork	10	Documentation
	Attendance	5	Tally

The growth mindset

- *Research results state:*
 - People can learn new skills when they believe that their effort matters
 - Learning takes effort
 - Intelligence can grow with effort
- Alternative mindset: *fixed* (C. Dweck)
- The fixed mindset says that innate talent, not effort, is decisive and changeless

Hidden curiosity and talent

- You were born curious; it's in your nature
- Schooling may fail to support curiosity
- One option is to allow our curiosity to re-emerge as part of our true selves
- This can enable effortless effort
- It helps me to be present to what I study

Quality and learning

- Research says people enjoy doing quality work (W. Glasser)
- This requires freedom of choice and control of work environment
- Coercion and boredom may discourage quality work
- Part of learning is recognizing quality work
- Please evaluate your work and get others' evaluations!

Grades, learning, and effort

- Learning requires *curiosity, intention to learn, and undistracted effort*
- Attention to grades distracts from what we're learning
- If grades measure learning, then:
 - *Getting higher grades requires paying less attention to grades!*

Academic integrity

- Directly lifted text must be quoted and credited
- Use of ideas or other information must be credited by citations or references
- Citation standards for MLA and APA are given at www.citationmachine.net
- *Plagiarism*: “occurs when you use someone else’s ideas or words and represent them as your own.” Cite your friends!
- See catalog for FSU policy

What signing work means

- In this course, all code and words submitted are to be of the *student who signs the work*
 - *Quizzes*: no collaboration or device use
 - *Exercises*: device use and collaboration are recommended
- *Principles*:
 - *Words* belong to the original writer
 - *Ideas* belong to everyone; but we acknowledge their sources

A proposed agreement

I commit to:

- know the course material, present it clearly
- return submitted work within a week
- welcome questions and answer them helpfully

You commit to:

- prepare for class and submit evidence of it
- ask questions
- answer reasonable questions, risking error
- work sometimes in groups
- present results or lead discussions

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