CMSC 11
Intro to Computer Science

- An overview of the fundamental principles of computer science with programming in C
- 3 units (2 hrs lecture, 3 hrs lab per week)
- Prerequisite: College Algebra (MATH 11 or MATH 17)
- Offered regular every semester and summer

Lecturer: Jaime M. Samaniego, Room c-115

Key topics we will cover

- Algorithms and fundamentals of programming
- Representation, translation and execution of programs
- The evolution of operating systems
- Data structures and algorithms
- Networks of computers
- Applications
- Social issues and the future of computing

What you learn on your own
(or study in other intro courses)

- Using office applications such as word processing, spreadsheets, presentations, etc – take IT 1 instead (IT 1 is a beginner-friendly GE course)
- Using electronic mail, web surfing, making your own cute home page, etc – take CMSC 2 instead
- Playing games, downloading music and chatting – fun for most, but please do this outside your lab classes (penalties apply)

How to be a good CS student

- Watch, listen and read about how professionals do it
- Then try to do things yourself, eventually learning to solve new problems on your own

"I hear and I forget,
I see and I remember,
I do and I understand."

Pair programming in the labs

- You may work with a partner during lab exercises but it is your responsibility to contribute to the team and learn together in the process
- Plan your solutions together on paper first, then work together on a single computer

Pair programming model

- One acts as a driver (controls the mouse and keyboard), the other navigates watching out for errors and suggesting improvements, swap roles halfway during the session

www.pairprogramming.com

So what is computer science?

- The study of computers? (too narrow; CS is a lot more than the study of the machines and the peripheral equipment)

- EW Dijkstra, a famous computer scientist argues that the term CS is quite unfortunate -- analogous to surgery being referred to as “knife science”

www.cs.utexas.edu/users/EWD/transcriptions/EWD09xx/EWD924.html

Computing in general

- Computing -- any goal-oriented activity requiring, benefiting from, or creating computers
  - Designing and building hardware and software systems for a wide range of applications
  - Processing, structuring and managing various types of information
  - Doing scientific studies using computers
  - Making computers behave intelligently
  - Creating and using communications and entertainment media

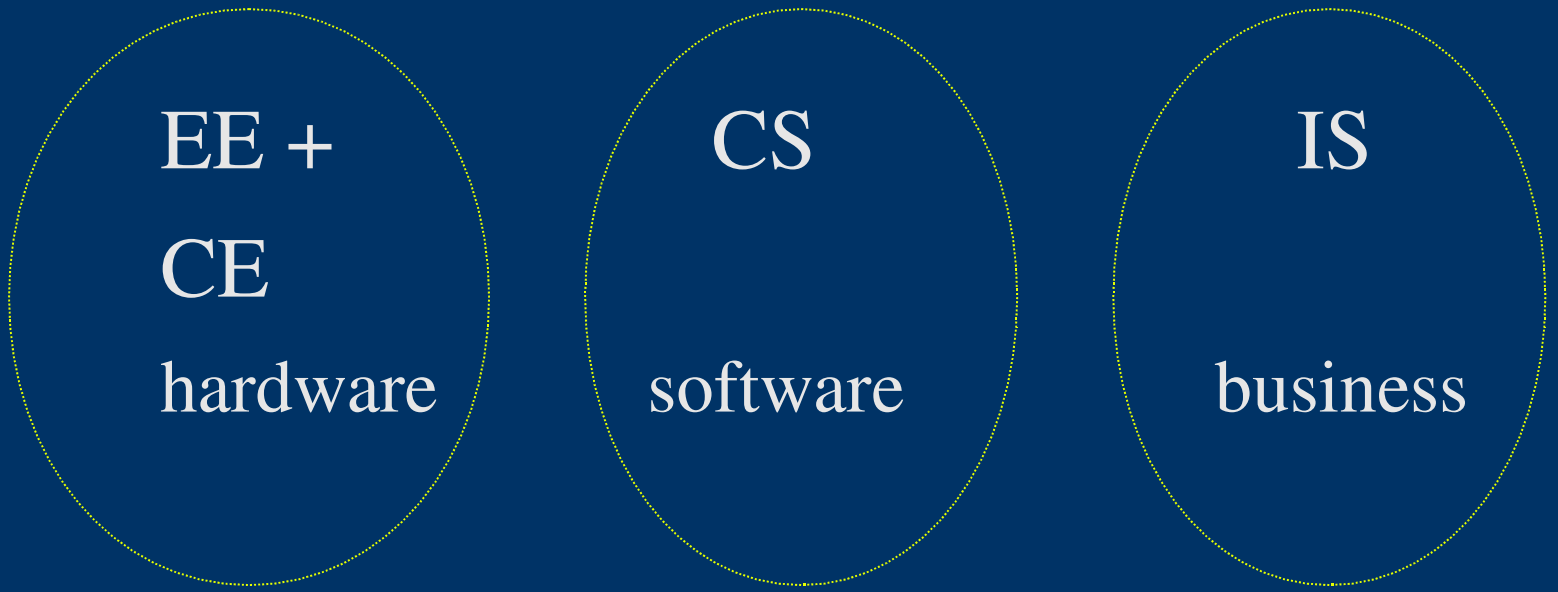
(ACM Computing Curricula 2005)

Computing disciplines

- Computer engineering
- Computer science
- Information systems
- Information technology
- Software engineering

- ACM Computing Curricula 2005

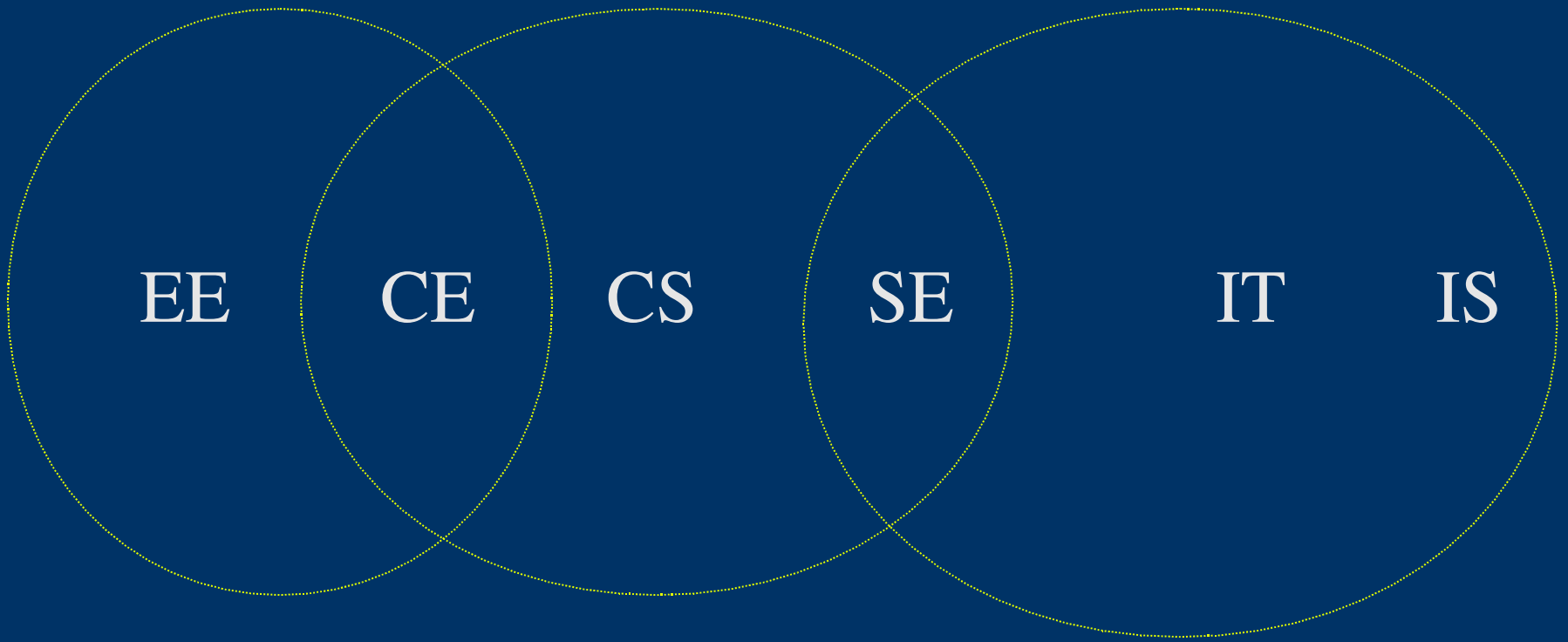
Pre-1990s view of computing



hardware – physical machine (processors, input, output, storage and communication devices, etc)

- software – all programs (system and applications)

Post-1990s view of computing

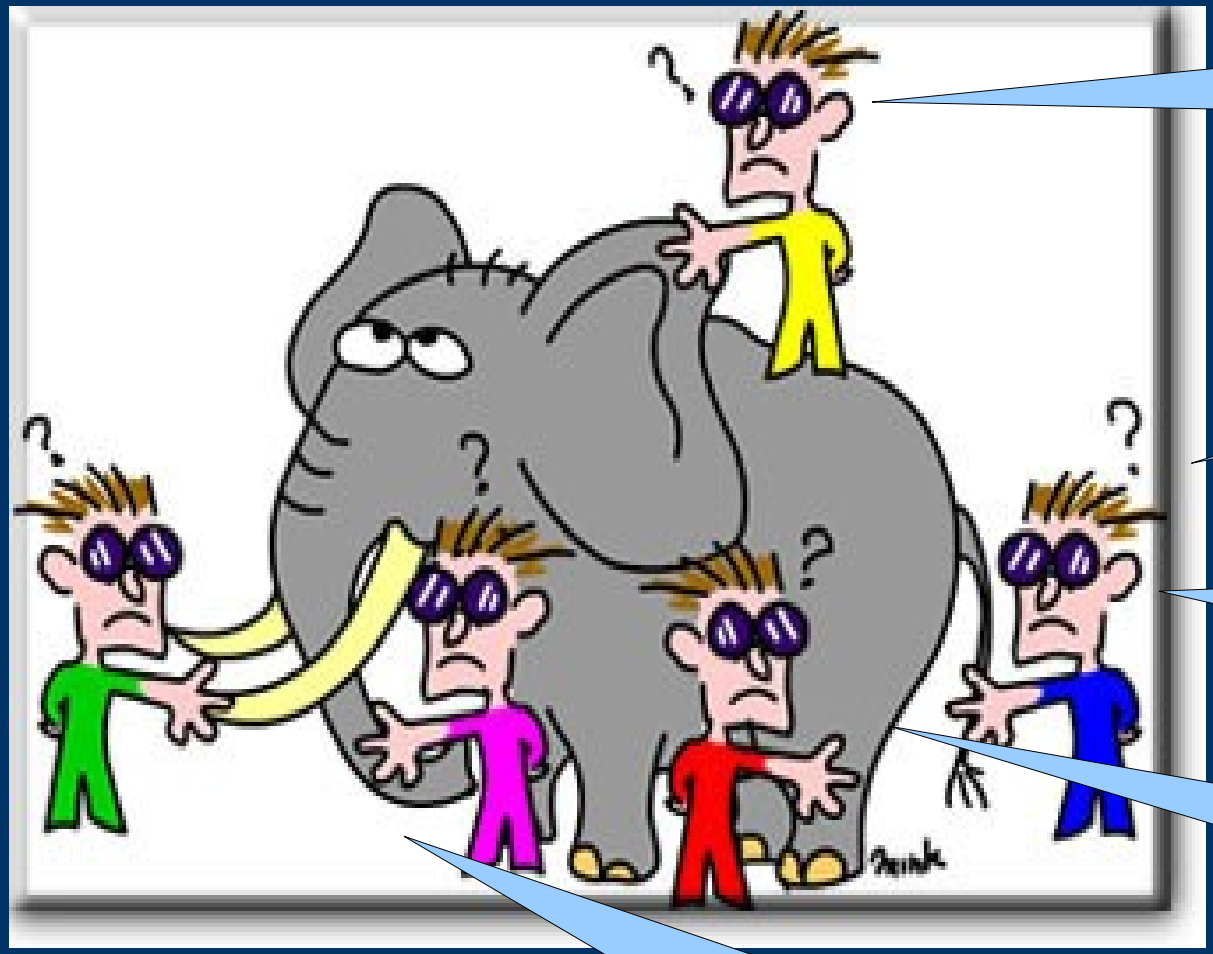


Systems & applications software

- Applications software
  - Office applications: word processing, spreadsheets, presentations
  - Email, web surfing, chatting and video conferencing
  - Specialized software, e.g., math/stat, engineering, etc
  - Computer games and other entertainment
- Systems software
  - Operating system, e.g., Windows, UNIX/Linux, etc
  - File management, archiving/compression, security
  - Language compilers for developing new programs

The battle of operating systems

What is computer science?



www.pixelmonger.com

about computers and networks

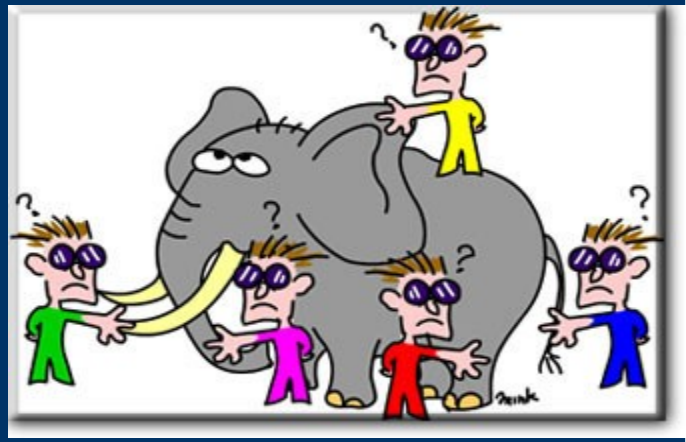
... algorithms

... programming

a branch of math

a branch of engineering

What is computer science?

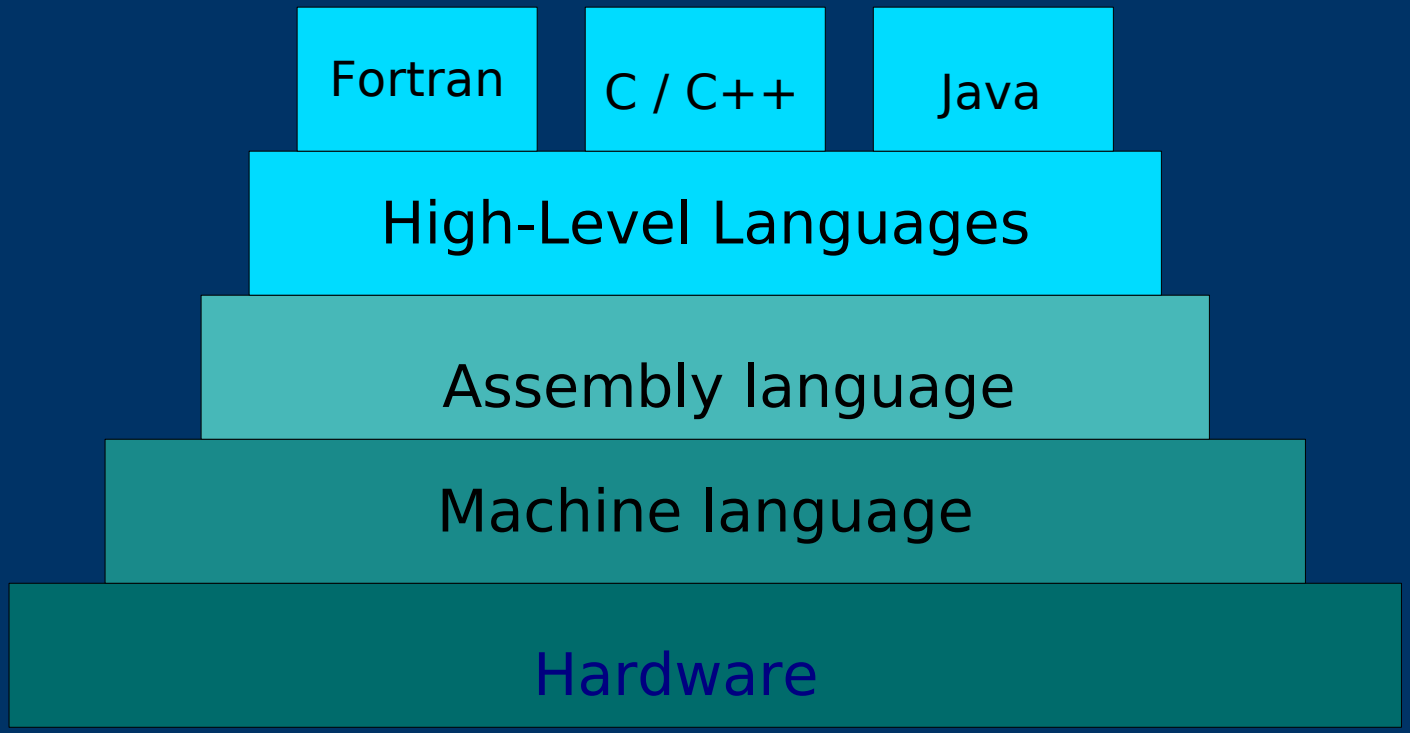


- CS is the study of **problems**, the design and analysis of efficient **algorithms** and **data structures** for their solution, **programming languages** for implementing these algorithms and data structures, **physical hardware** for running the programs, **software systems** for the efficient use of resources, **software engineering methodologies** to manage large software projects

Areas of study in CS

- Programming foundations
  - 2 intro to the Internet
  - 11 general intro to CS and basic C programming
  - 21 intermediate C programming
  - 22 object oriented (Java)
  - 100 web programming
  - 124 programming languages
  - 131 computer organization, machine level programming

High- and low-level languages



www.webopedia.com

Areas of study in CS

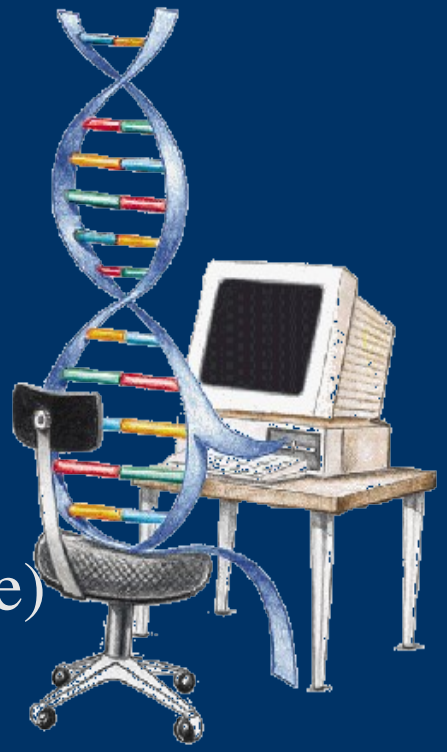
- Systems and Computer Organization/Architecture
  - cs125 operating systems
  - cs130 logic design and digital computer circuits
  - cs131 computer organization, machine level programming
  - cs132 computer architecture
  - cs137 data communications and networking

Areas of study in CS

- Discrete math and Theoretical foundations
  - cs56, cs57 discrete math I and II
  - cs123 data structures
  - cs141 automata and languages theory
  - cs129 compiler design (elective)
  - cs142 design and analysis of algorithms
  - cs180 parallel computing (elective)

Areas of study in CS

- Applications
  - cs127 file processing and database systems
  - cs128 software engineering
  - cs150 numerical and symbolic computation
  - cs161 computer graphics (elective)
  - cs165 image/video processing (elective)
  - cs170 artificial intelligence (recommended elective)
  - cs172 robot modeling (elective)
  - cs191 various special topics, e.g., image processing, forensic computing, bioinformatics, etc (electives)



Some possible electives
and research directions

- Math and Statistics
  - operations research, statistical computing, cryptography
- Physics and Engineering
  - computational physics, process monitoring and control, robotics, computer aided design
- Accounting, Marketing and Economics
  - business and management information systems
  - virtual stores, e-commerce, security in e-transactions

Some possible electives
and research directions

- Biology and Chemistry
  - bioinformatics, computational biology, ecological modelling, cheminformatics, chemical databases
- Medicine
  - expert systems, medical imaging, tele-medicine
- Environment, Agriculture, Forestry
  - geographic information systems
- Education
  - computer-based learning, virtual learning environments for distance education