Course Summary

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Computer Systems

system utilities

shell
vi
make
gdb

prog. language

.c

.s

.o

linker

a.out

.so

loader/dynamic linker

system call interface

Operating system

I/O Networking

File systems

Processes/threads

Virtual memory

Binary representation
Byte ordering
Instruction Set Architecture (ISA)
Memory Management Unit (MMU)
Pipelining

CPU

Memory hierarchy

locality
caching
Performance Issues

- There’s more to performance than asymptotic complexity.
  - Constant factors matter too!
    - Easily see 10:1 performance range depending on how code is written.
    - Must optimize at multiple levels: algorithm, data representation, procedures, and loops
  - Must understand system to optimize performance
    - How programs are compiled and executed.
    - How to measure program performance and identify bottlenecks.
    - How to improve performance without destroying code modularity and generality.
Well...

The end ??

No! It is the beginning of many important courses you MUST take!!!
Remember?

- ICE3028: Embedded System Design
- CSE3026: Embedded Systems
- ICE3001: Microprocessor
- ICE3024: Digital Systems
- ICE3003: Computer Architectures
- ICE3008: Operating Systems
- CSE3007: Database
- ICE3026: Computer Networks
- CSE3039: Programming Languages
- CSE2023: Compilers
- CSE2003: System Programming
- ICE2002: Data Structures
- ICE2001: Logic Circuits
- GEDD007: Programming

Advanced / Interdisciplinary

Core

Fundamental

= Introduction to Computer Systems
Want More?

- **Computer Architectures**
  - How to design an Instruction Set Architecture (ISA)?
  - How to build a high performance processor?

- **Programming Languages**
  - Means for high-level programming

- **Compilers**
  - Bridging the Semantic Gap
  - Machine-independent optimizations
  - Machine-dependent optimizations

- **Operating Systems**
  - Provides system calls for application programming
  - Resource sharing & management: CPU, memory, devices, etc.

- **Computer Networks**
  - How to make the communication between machines work?

- **Database Systems**
  - One of serious applications that needs systems-level support

- **Embedded Systems**
  - Special purpose
  - Limited resources
  - Low-power requirement

- **Distributed Systems**
  - Applications and services that span multiple computers
Last Reminder..

- **Final exam: 6/14 (Monday)**
  - Class A: 15:00 – 16:30
  - Class B: 16:20 – 17:50

- **Thank you!**