2110714 Digital Systems

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Syllabus

This lecture aims to integrate the knowledge of building a computer system from the most bottom level: functional units, data path, microprogram, to the highest level: operating system, high level language and application programs. The lectures cover three main areas: processor, compiler and operating system. This course offers a "hand-on" approach. Students go through series of building and modifying a "system" simulator. The system simulation composed of: an instruction-level processor simulator, a compiler, a profiler, an operating system includes task switcher and message passing. Concurrent application programs will be run on this operating system. To ground the processor simulator, a small embed development board will be used to implement an emulator of the processor used in the class.

Assessment

class work	10%
two small projects	40%
final exam	50%

Topic by Week

Overview of building a computer system	Machine level programming for Sx-chip
Introduction to language and compiler	Compiler
Computer language and semantic	Evaluator (virtual machine)
Computer Architecture	Code generator
Microprogramming	Operating System
Processor Sx-chip Sx-microprogram	Supervisor program
How to microprogram Sx chip	Performance measurement
Making a new instruction for Sx-chip	Concurrency

Reference Texts

- Chongstitvatana, P., The Essence of Computer System Engineering, in preparation, 312 pages, since 2006. (on the web)

Computer languages

- Sebesta, R. Concepts of programming languages, 6th ed. Pearson/ Addison-Wesley, 2004.
- Louden, K., Compiler Construction: Principles and Practice, PWS Pub., 1997.

Computer architecture

- Hennessy, J., and Patterson, D., Computer Architecture: a quantitative approach, 3rd ed. Morgan Kaufmann, 2003.
- Patterson, D., and Hennessy, J., Computer Organization and Design: the hardware/software interface, 2nd ed. Morgan Kaufmann, 1998.

Operating systems

- Tanenbaum, A., Modern Operating Systems, Prentice Hall, 2001.
- Silberschatz, A., Galvin, P., Gagne, G., Operating System Concepts, 6th ed. John Wiley, 2003.

Additional materials will be hand-out as needed.