Computer Architecture

Comprehensive Exam Syllabus

March 2015

Topics:

1. Fundamentals of Quantitative Design and Analysis – instruction set architectures, trends in technology, in power and energy, and in cost, dependability, performance measuring

2. Instruction-Level Parallelism and Its Exploitation – data and control hazards, execution pipelining, basic compiler techniques, static branch prediction, advanced compiler support, hardware support for more parallelism, dynamic hardware prediction, high-performance instruction delivery, multiple issue, hardware-based speculation, multi-threading

3. Memory Hierarchy Design – basic memory hierarchy, cache design and its optimizations for access time reduction, advanced cache optimizations to lower access time

4. Thread-Level Parallelism – centralized shared-memory architectures, performance of symmetric shared-memory multiprocessors, distributed shared-memory and directory-based coherence, synchronization, memory consistency modeling

5. Data-Level Parallelism – vector architecture and processors, graphics processing units, loop-level parallelism

Suggested Reference:

- *Computer Architecture: A Quantitative Approach* (5th Edition), by John L. Hennessy and David A. Patterson, Morgan Kaufmann Publishers, Inc., 2012, ISBN: 978–0–12–383872–8.