
ELL782: Computer Architecture

<http://www.cse.iitd.ac.in/~sumantra/courses/arch/arch.html>

General Information

No one shall be permitted to audit the course. People are welcome to sit through it, however. The course is open to all suitably inclined Masters and Doctoral students.

Schedule for classes: [Slot A]

Credits: 3 (LTP: 3-0-0)

Mon: 08:00 - 09:30, Thu: 08:00 - 09:30

Room: III-336

Textbook:

- J. L. Hennessey, D. A. Patterson. *Computer Architecture: A Quantitative Approach*. Fifth Edition, Elsevier, 2012.

Reference Books:

- D. A. Patterson, J. L. Hennessey. *Computer Organization and Design: The Hardware/Software Interface*. Third Edition, Elsevier, 2005.
- J. P. Hayes. *Computer Architecture and Organization*. Third Edition, WCB/McGraw-Hill, 1998.
- K. Hwang, F. A. Briggs. *Computer Architecture and Parallel Processing*. McGraw-Hill, 1985.
- M. M. Mano. *Computer System Architecture*. Third Edition, PHI, 1993.
- P. Kogge. *Architecture of Pipelined Computers*. McGraw-Hill, 1977.
- W. Stallings. *Computer Organization and Architecture*. Macmillan Publishing Company, 1986.
- W. Stallings. *Computer Organization Architecture: Designing for Performance*. Sixth Edition, Pearson Education, 2003.
- K. Hwang. *Advanced Computer Architecture: Parallelism, Scalability, Programmability*. McGraw-Hill, 1993.
- J. D. Carpinelli. *Computer Systems Organization & Architecture*. Pearson Education Asia, 2001.
- W. Stallings. *Reduced Instruction Set Computers*. Second Edition, IEEE Computer Society Press, 1990.
- B. Govindarajalu. *Computer Architecture and Organization: Design Principles and Applications*. Tata McGraw-Hill, 2004.
- H. S. Stone. (Ed.) *Introduction to Computer Architecture*. Second Edition, Galgotia Publications Pvt. Ltd., 1990.
- V. Kumar, A. Grama, A. Gupta, G. Karypis. *Introduction to Parallel Computing*. The Benjamin/Cummins Publishing Company, Inc., 1994.
- D. P. Bertsekas, J. N. Tsitsiklis. *Parallel and Distributed Computation*. Prentice-Hall International, Inc., 1989.
- C. Hamacher, Z. Vranesic, S. Zaky. *Computer Organization*. Fifth Edition, McGraw-Hill, 2002.
- A. S. Tanenbaum. *Structured Computer Organization*. Fourth Edition, Pearson Education, 1999.

Papers:

- D. A. Patterson. Reduced Instruction Set Computers. *Communications of the ACM*, vol. 28, no. 1, January 1985, pp. 8 – 21.

The above list is (obviously!) not exhaustive. Other reference material will be announced in the class. The Web has a vast storehouse of tutorial material on Computer Architecture, and other related areas.

Mini Project ... A combination of theoretical work as well as programming work. Both will be scrutinized in detail for original work and thoroughness. For the programming part, there will be credit for good coding. Spaghetti coding will be penalized. Program correctness or good programming alone will not fetch you full credit ... also required are results of extensive experimentation with varying various program parameters, and explaining the results thus obtained. The Mini Project will have to be submitted on or before the due date and time. Late submissions will not be considered at all. Unfair means will result in assigning as marks, the number said to have been discovered by the ancient Indians, *to both parties (un)concerned*.

Examinations and Grading Information:

Minor I: 28 Minor II: 28 Mini Project: 16 Major: 28

Attendance Requirements: As per Institute rules. Illness policy: illness to be certified by the IITD Hospital. *Attendance in Examinations is Compulsory.*

Proposed Course Outline

1. Quantitative design and analysis; Instruction set samples
2. Instruction-level parallelism; Theory of Pipelining
3. Memory hierarchy design; Cache; Virtual Memory
4. Thread-Level Parallelism
5. Data-Level Parallelism in Vector, SIMD, GPU Architectures
6. Warehouse Scale Computers; Blade Architecture; Interconnected Networks
7. Miscellaneous Topics: Hardware and Software for VLIW and EPIC; Multicore Architectures; Storage Systems