

EC-820 Advanced Computer Architecture

Credit Hours

3 semester credit hours

Course Outline

Course Objectives: The course provides an introduction to advanced principles and current practices in computer architecture. It covers topics such as instruction set design, hardware and software methods for exploiting parallelism, memory hierarchies, and input/output systems. The course also introduces multiprocessor concepts but does not provide an in-depth study of this area.

Course Contents:

1. Computer Organization review
2. Instruction Set Design principles and MIPS architecture
3. Pipelining
 - Basic pipelining
 - Data and control Hazards
 - Exceptions
 - Branch Prediction
 - Speculation
4. Instruction level Parallelism
 - Score Board Architecture
 - Dynamic Scheduling – Tomasulo algorithm
 - Multiple instruction issue using superscalar approach
 - VLIW – software based ILP
5. Compilers and code optimization
6. Caches
 - Cache basics
 - Techniques to reduce miss rate
 - Techniques to reduce miss penalty
7. Programming for memory performance
8. Main memory organization
9. Virtual Memory and paging
10. Storage devices
11. Beyond ILP: Future microprocessor architectures

Prerequisites: You must understand basic machine organization, logic design and assembly language programming. Basic operating system concepts would be helpful though not an essential prerequisite.

Text Book:

Computer Architecture: A quantitative approach, 3rd Edition.

By: John L. Hennessy and David A. Patterson