



BAKER COLLEGE
STUDENT LEARNING OUTCOMES

**CIS 4010 Advanced Computer
Architecture**
3 Semester Hours

Student Learning Outcomes and Enabling Objectives

1. Analyze instruction sets of computer languages.
 - a. Present an overview of essential characteristics of machine instructions.
 - b. Describe the types of operands used in typical machine instruction sets
 - c. Describe the various types of addressing modes common in instruction sets
 - d. Present an overview of x86 and ARM data and operation types, addressing modes, and instruction formats
 - e. Examine the distinction between machine language and assembly language
2. Explore assembly language
 - a. Describe the key elements in assembly language
 - b. Explain programs written in NASM
 - c. Summarize the steps of the assembly process
 - d. Present an overview of the loading and linking process
3. Describe processor structure and function
 - a. Distinguish between user-visible and control/status registers, and discuss the purposes of registers in each category
 - b. Summarize the instruction cycle
 - c. Discuss instruction pipelining and various forms of pipeline hazards
 - d. Present an overview of the x86 processor and ARM processor structures
4. Describe Reduced Instruction Set Computers
 - a. Summarize the key characteristics of RISC machines
 - b. Discuss the use of compiler-based register optimization to improve performance
 - c. Discuss the implication of a RISC architecture for pipeline design and performance
 - d. Explain key approaches to pipeline optimization on a RISC machine
5. Examine instruction-level parallelism and superscalar processors
 - a. Define instruction-level parallelism
 - b. Explain the difference between superscalar and superpipelined approaches
 - c. Describe techniques of improving pipeline performance in RISC machines and superscalar machines
6. Explain control unit operation

- a. Define micro-operations and the principal instruction cycle phases in terms of micro-operations
 - b. Discuss how micro-operations are organized to control a processor
 - c. Discuss hardwired realization vs. microprogrammed realization
7. Describe parallel processing
- a. Summarize the types of parallel processor organizations
 - b. Discuss cache coherence in a multiple processor system
 - c. Explain implicit and explicit multithreading
8. Explore multicore computers
- a. Discuss hardware and software performance issues addressed by multicore computers
 - b. Present an overview of the two principal approaches to heterogeneous multicore organization
 - c. Describe the use of multicore organization on embedded systems, PCs and servers, and mainframes

Big Ideas and Essential Questions

Big Ideas

- Machine instruction characteristics - operands, addressing modes, and formats
- Assembly language
- Processors: x86 and ARM structures
- High performance computers - RISC machines, parallel processing, and multicore computers

Essential Questions

How do processors work and what are the structures of the x86 and ARM processors?

What are the advantages of assembly language?

What techniques are used to increase the performance of processors and computers?

These SLOs are not approved for experiential credit.

Effective: Fall 2021