Course content

The course introduces fundamental concepts in computer system architecture and design, focusing on the structure and functionality of modern microprocessors and computing systems. It provides essential knowledge for understanding and designing computer systems with emphasis on performance evaluation and optimization.

The following topics are covered in the course:

1. Computer Organization: The basic structure of a computer system, including CPU, memory, and input/output components.
2. Instruction Set Design: Design principles of instruction sets and their impact on system performance and capabilities.
3. Memory System Design: Techniques for designing efficient memory hierarchies, including cache memory and virtual memory.
4. Pipelining: The principles and techniques of instruction pipelining to improve processor performance.
5. Parallel Processing: Introduction to parallelism in computer systems, including multi-core and multi-processor architectures.
6. System-Level Topics: Concepts in multi-processor systems and the fundamentals of cloud computing.
7. Performance and Power Evaluation: Methods for quantitatively evaluating system performance and power consumption, focusing on trade-offs in design decisions.

Course objectives

Knowledge

1. Acquire a comprehensive understanding of computer system architecture, including microprocessor design, instruction sets, memory systems, and parallel computing.
2. Understand key system-level topics, including multi-processor systems and cloud computing fundamentals.
3. Gain proficiency in performance evaluation methods for computer systems, considering various design metrics such as power and efficiency.

Skills

1. Develop the ability to represent complex problems using pseudocode, assembly language, C, or Verilog.
2. Enhance problem-solving skills by applying fundamental principles of computer systems to evaluate and optimize system performance.
3. Conduct in-depth analysis and simulations to assess the trade-offs between different architectural choices in system design.

Competencies

1. Apply computer system architecture principles to solve complex engineering problems related to computer design.
2. Evaluate, model, and optimize computer systems for performance and efficiency.

3. Communicate the results of performance evaluations, propose improvements, and adapt systems to meet specific engineering goals.