ECMP 419: COMPUTER SYSTEM ARCHITECTURE

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INTRODUCTION

Uniprocessors and Multiprocessors. SIMD and MIMD architecture models. High performance techniques. Technology impact on architecture. Instruction set architecture. Performance measurements. Reduced Instruction set design (RISC).

UNIPROCESSOR ARCHITECTURES

Fundamental architecture model. Data path and control path. Memory, register files and cache. Bus structures. Instruction set architecture. Architecture design.

PIPELINE DESIGN

Fundamental principles. Arithmetic pipeline structures. Instruction pipeline techniques. RISC instruction pipelines. Pipeline sequencing and control.

SUPERSCALAR ARCHITECTURES

Instruction level parallelism. Instruction scheduling (static). Dynamic instruction scheduling, Tomasulo's algorithm. Reservation stations and scoreboard techniques. Horizontal machine architectures. Multithreaded machines. The VLIW model. Examples.

APPLICATION SPECIFIC ARCHITECTURES

Fundamental models. The DSP Architecture synthesis problem. Behavioral, data flow and control flow models. Scheduling and resource allocation for DSP architecture synthesis. Memory and datapath mapping techniques. Technology mapping. Real life examples - image compression.

PARALLEL PROCESSING ISSUES

Principles of Parallel processing. Multiprocessors and multicomputers. Parallel memories. Shared and local memories. Message passing and synchronization.

INTERCONNECTION NETWORKS

Classification of networks. Mesh networks. Hypercube networks. Shuffle networks. Other swittching networks. ATM network techniques. Fast ethernet. Parallel processing with network of workstations.

PARALLEL ALGORITHMS

Algorithms for continuum models. Algorithms for discrete models. Data parallelism and domain decomposition. Performance analysis.