COMPUTER ARCHITECTURE

over view

This course provides an introduction to the field of computer architecture. The history of the area will be examined, from the first stored program computer to current research issues. A study of the design of computers. Topics include the design of combinatorial and sequential circuits, design methodology of a basic computer, central processor organization, microprogramming, memory organization, input-output organization, and arithmetic processor design. As time permits, further topics, such as vector and parallel processing, are discussed. A functional, logical (theoretical) approach is adopted.

This also covers topics in advanced computer architecture with an emphasis on techniques for improving performance. We will examine the interaction between hardware and software (operating systems, compilers, and application programs) as well as the cost/performance tradeoffs of computer architecture.

We will cover the following topics (in approximate order): fundamentals of computer design; instruction set principles and examples; RISC vs. CISC; pipelining; advanced pipelining and instruction-level parallelism; instruction scheduling; memory-hierarchy design; storage systems; interconnection networks; multiprocessors and cache coherence; parallel and distributed systems (if time permits); and miscellaneous topics from the current literature.

Topics covered will include successful and unsuccessful machine designs, cache memory, virtual memory, pipelining, instruction set design, and hardware/software tradeoffs. Readings will be from the text and an extensive list of papers. Assignments will include homeworks and a substantial project, intended to acquaint students with open questions in computer architecture.

SYLLABUS

Btc-124: Computer Architecture

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Introduction

Generation of computers, Classification of computers, Organisation, Structure and function, Von Neumann architecture, Performance parameters.

Unit 2

Computer system

System bus, Bus Structure, Elements of Bus design (Type, Arbitration, Timing, Width, Data transfer Type), Interrupts, Instruction Cycle state Diagram with interrupts/Without interrupts, Characteristic of Internal memory (ROM, PROM, EPROM, Flash memory), Characteristic of External memory (Magnetic memory, RAID, Optical memory, Magnetic Tape), Input / Output: (External / Peripheral Device, Function of I/O module, Programmer I/O, Interrupt Driver I/O DMA), External Interface (Serial, Parallel) ,

Introduction to OS, Functions of OS, Uniprogramming , Multiprogramming ,Time Sharing systems.

Unit 3

The Central Processing Unit

ALU, Binary Arithmetic, Floating point Arithmetic, Basic combinational and sequential Circuit Design, RTL representation, Instruction sets (Characteristics, Functions, Addressing modes, Formats), Processor Organization, Register Organization, Instruction Cycle, Instruction Pipelining, Types of processors.

Unit 4

Control Unit

Micro operations, Controls of the CPU, Control unit Implementation (Hardwired, Micro programmed), Overview of parallel Processing.