

Course Name : Computer Architecture

Pre-requisite : Computer Logic Design and Computer Organization

Credit Hours : 3

Course Contents:

Computer Organization: Control Unit Design,
Instruction Execution and Sequence of Control Signals
Hardware and Micro programmed Control

Input- Output- Programmed, Interrupt Driven and DMA,

I/O and Interface Design,

Arithmetic Logic Unit Implementation, Addition,
Subtraction, Multiplication and Division Operations for
Integer and Floating Point Numbers,

Memory Organization,

Memory Hierarchy,

Cache Memories,

Mapping Functions and Page Replacement Policies,

Memory Management Requirements

Virtual Memory, Hardware Support,

Fundamentals of Computer Communications and Error Control.

Suggested Textbooks:

- Computer Organization and Architecture by W. Stallings, Published by Prentice-Hall, 1999.
- Computer Organization and Architecture by Hyeo, J.P. 2nd Edition, Published by McGraw-Hill.

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Location of resources :

http://atrc.net.pk/resources/ku_comp_arch_jan_2020

Format for assignments :

From 7 Feb 2020 onwards. All assignments need to be written on paper and the image (picture) of the paper emailed.

If you have sent any assignment after 7 Feb 2020 in typed format only, you can resend it with the handwritten paper.

If you want to include images from other sources, you can paste your handwritten text in a document and include the images into the document.

All assignments are to be emailed.

Effective scanning resolution should be at least 150 DPI.

For example for A4 pages which are 8.5 x 11 inches it is 1275 x 1650 pixels minimum.

If you send it a week before the due date, it is likely to be updated in the results file so you can be sure it was done before the due date.

To check email receiving, you can send an email to ask for an immediate reply to see if your emails are being received.

You can also ask for an immediate reply with your assignment so that it can be confirmed that your assignment was received.

Emails shall be replied to most likely in a few days depending on time available.

Assignment 1 : Read Chapter 4

Write one page on what you understood. Send all questions.

Email.

10 Points

Due date : 7 Feb 2020

Assignment 2 : Read Chapter 7

Write one page on what you understood. Send any questions.

See videos mentioned below related to Input and Output.

Write one page on what you understood. Send any questions.

Research on your own how the USB Universal Serial Bus works.

Write down resources analyzed and write one page on what you understood. Send any questions.

20 Points

Due date : 20 Feb 2020

Assignment 3 : Virtual Memory

See videos mentioned below related to Virtual Memory
Write one page on what you understood. Send any questions.

15 Points

Due date : 27 Feb 2020

Assignment 4 : ALU

See videos mentioned below related to ALU

Read Chapter 9 of the book.

Write one page on each of the following subtopics on what you understood

1. ALU integer representation
2. Addition
3. Subtraction
4. Multiplication
5. Division.
6. Real number representation

Send any questions on any subtopics you do not understand.

25 Points

Due date : 5 March 2020

Assignment 5 : Floating point and Fault Tolerant Example

See the and understand the videos and articles on floating point numbers in the [ALU section](#) of the resources in this document. Write in your own words your understanding of IEEE's floating point number representation.

Fault tolerant design example

http://atrc.net.pk/resources/ku_comp_arch_jan_2020/fault%20tolerant%20design/

See this :

http://atrc.net.pk/resources/ku_comp_arch_jan_2020/fault%20tolerant%20design/Fault%20Tolerant%20Systems%20Stratus%20ftServer%20For%20Five%20Nines%20Uptim.mp4

Explain what it means by five nines in reliability.

Read this :

http://atrc.net.pk/resources/ku_comp_arch_jan_2020/fault%20tolerant%20design/Redundant%20Red%20Hat%20Linux%20High%20Availability%20Intel%20Server.pdf

Explain what the concept of lockstep.

How software needs to be changed to coordinate for reliability of the system.

Understand this :

http://atrc.net.pk/resources/ku_comp_arch_jan_2020/fault%20tolerant%20design/Stratus-Uptime-Assurance-Architecture-For-Linux.pdf

Explain the difference between the terms

Fault tolerant (FT)

High Availability (HA)

and Normal reliability (conventional)

Reliability Levels.

Understand this :

http://atrc.net.pk/resources/ku_comp_arch_jan_2020/fault%20tolerant%20design/ds-ftserver-2900-4900-6900.pdf

Explain what is a CRU (Customer replaceable unit) and the concept of hot swapable.

20 Points

Due date : 13 March 2020

Assignment 6 : Buses

See the videos in the section of [computer buses](#) in this document and answer the following questions.

Describe the evolution of buses from ISA to PCI.

What do you understand about the new CXL Bus.

What do you understand about motherboards.

What do you understand about the CAN bus.

20 Points

Due date : 20 March 2020

Assignment 7 : Computer evolution

See the videos in the section of [Computer evolution](#) and the section of [CISC vs RISC](#) in this document and answer the following questions.

Summarize the computer evolution in your own words.

What do you understand about the x86 architecture.

What do you understand about the ARM architecture.

Describe the difference between RISC and CISC in your own words.

Why do you think ARM is becoming so popular in mobile devices ?

25 Points

Due date : 27 March 2020

Assignment 8 : Error detection and correction

See the videos in the section of error detection and correction in this document and answer the following questions.

Describe what you understand about parity.

Describe how the hamming code does detection and correction.

Describe CRC checking.

Describe MD5 Sum checking

Explain why RAID is not a good ideas vs ZFS and BTRFS or SANs in the current times of computing.

25 Points

Due date : 3 April 2020

Assignment 9 :

See the following videos and answer the questions provided below.

Smart Phone Architectures

https://www.youtube.com/watch?v=K6HgHyPsm_0

https://www.youtube.com/watch?v=_l8RC9HyKKQ

What are the differences between mobile CPUs and Desktop CPUs ?

<https://www.androidauthority.com/huawei-kirin-990-1022026/>

<https://consumer.huawei.com/en/campaign/kirin-990-series/>

<https://www.youtube.com/watch?v=2evmHgEDk4s>

Which features of the Kirin 990 do you think are useful and why ?

<http://www.techplayon.com/mobile-phone-architecture/>

Summarise the mobile phone architecture in your own words.

<https://www.androidpit.com/fastest-smartphone-processors>

Compare Qualcomm, Samsung and Huawei in mobile chipsets in your own words.

Which ones features do you like the most and why ?

15 Points

Due date : 10 April 2020

Assignment 10 :

CISC vs RISC

Goodbye x86. The FUTURE is RISC-V

<https://www.youtube.com/watch?v=67KW4t42SZk>

RISC vs CISC

https://www.youtube.com/watch?v=_EKgwOAAWZA

Intel is in serious trouble. ARM is the Future.

<https://www.youtube.com/watch?v=IfHG7bj-CEI>

ARM architecture | Embedded Systems | Lec-9 | Bhanu Priya

<https://www.youtube.com/watch?v=JPfG0UQd3x4>

ARM Processor - Sowing the Seeds of Success – Computerphile

<https://www.youtube.com/watch?v=1jOJl8gRPyQ>

ARM inventor: Sophie Wilson

<https://www.youtube.com/watch?v=jhwWrSaHdh8> (Part 1)

<https://www.youtube.com/watch?v=re5xAqgKqc0> (Part 2)

Explain why RISC based architectures like the ARM (Acorn RISC Machine) are the future compared to CISC based architectures ?

ARM New CPUs

<https://www.youtube.com/watch?v=zg9jKH4Yb1A>

<https://techcrunch.com/2020/02/10/arm-focuses-on-ai-with-its-new-cortex-m-cpu-and-ethos-u-npu/>

http://atrc.net.pk/resources/ku_comp_arch_jan_2020/ampere%20altra%20cpu%20mar%202020/Altra_PB_v0.60_20200227.pdf

[http://atrc.net.pk/resources/ku_comp_arch_jan_2020/ampere%20altra%20cpu%20mar%202020/Mt. Jade PB v0.50 20200227.pdf](http://atrc.net.pk/resources/ku_comp_arch_jan_2020/ampere%20altra%20cpu%20mar%202020/Mt._Jade_PB_v0.50_20200227.pdf)

[http://atrc.net.pk/resources/ku_comp_arch_jan_2020/ampere%20altra%20cpu%20mar%202020/Mt. Snow PB v0.50 20200227.pdf](http://atrc.net.pk/resources/ku_comp_arch_jan_2020/ampere%20altra%20cpu%20mar%202020/Mt._Snow_PB_v0.50_20200227.pdf)

Summarize the features of the Altra CPU and describe which new computer science areas it is designed to target.

5G Architectures

http://atrc.net.pk/resources/ku_comp_arch_jan_2020/5g%20chips/The%20Route%20to%205G%20-%20ARM%20Whitepaper.pdf

<https://venturebeat.com/2020/02/24/intel-debuts-5g-server-and-base-station-chips-plus-a-pc-network-card/>

<https://community.arm.com/developer/ip-products/processors/b/processors-ip-blog/posts/a-potential-look-inside-the-5g-baseband-processor>

<https://www.xilinx.com/applications/wireless-communications/5g-radio.html>

<https://www.xilinx.com/products/silicon-devices/soc/rfsoc.html>

Define the terms DSP, 5G baseband, and how it is related to new CPU architectures for upcoming devices.

25 Points

Due date : 17 April 2020

Overall grading for all students :

Assignments : 40%

Mid Term : 20%

Final : 30%

Attendance : 10%

Relative grading : Maximum points is 100% and lower points are given a percentage linearly relative to points earned.

If an assignment is submitted after the deadline, some points shall be reduced based on how late it is from the deadline.

CPU

See How a CPU Works

https://www.youtube.com/watch?v=cNN_tTXABUA

Why Do Computers Use 1s and 0s? Binary and Transistors Explained.

<https://www.youtube.com/watch?v=Xpk67YzOn5w>

See How Computers Add Numbers In One Lesson

<https://www.youtube.com/watch?v=VBDoT8o4q00>

Why Do Computers Use 1s and 0s? Binary and Transistors Explained.

<https://www.youtube.com/watch?v=Xpk67YzOn5w>

CPU Architectures

IA-64 Architectures

IA-64 Architecture overview

<https://www.cs.helsinki.fi/u/kerola/tikra/IA64-Architecture.pdf>

RISCy Business: Intel's New IA-64 Architecture

<https://www.cs.umd.edu/users/meesh/cm411/website/projects/IA64-2/411project.htm>

Instruction sets

Top 10 Popular CPU Instruction Set Today

<https://www.youtube.com/watch?v=XAf0H1-ujzI>

CPU designs

The History of Intel Processors

<https://www.youtube.com/watch?v=Qu2njWY3Hjk>

Intel i9-9900K Explained: The Road to 5GHz

https://www.youtube.com/watch?v=jHQ_OdA-8IU

Introducing AMD Ryzen™ Threadripper™: Indisputable Processing Supremacy

<https://www.youtube.com/watch?v=VUuuuah2md8>

Intel 10th gen.

<https://www.youtube.com/watch?v=KhKbGhRBDIQ>

Manufacturing : How a CPU is made

<https://www.youtube.com/watch?v=qm67wbB5GmI>

Zoom Into a Microchip

<https://www.youtube.com/watch?v=Fxv3JoS1uY8>

CPU Cores VS Threads – Explained

<https://www.youtube.com/watch?v=hwTYDQ0zZOw>

A REAL 64 Core CPU - For SCIENCE!

<https://www.youtube.com/watch?v=I0U6ZMeVrB4>

This is EPYC™ 64 core

<https://www.youtube.com/watch?v=N5hibuBHlfw>

https://www.youtube.com/watch?v=pq7yyVX5C_I

Advanced CPU Designs: Crash Course Computer Science #9

<https://www.youtube.com/watch?v=rtAIC5J1U40>

Intel core i5 ad

<https://www.youtube.com/watch?v=VsvmQLDZn1I>

Intel Xeon for servers

<https://www.youtube.com/watch?v=f113uwqOr-A>

INTRODUCTION TO ITANIUM PROCESSOR IA-64

https://www.youtube.com/watch?v=egIzxf_AlqQ

Interesting Features of the X86-64 Architecture (OpenVMS Boot Camp 2017)

<https://www.youtube.com/watch?v=9acehWXepLg>

Intel: The Making of a Chip with 22nm/3D Transistors | Intel

<https://www.youtube.com/watch?v=d9SWNLZvA8g>

A REAL 64 Core CPU - For SCIENCE!

<https://www.youtube.com/watch?v=I0U6ZMeVrB4>

Mobile CPUs

Why No Intel Processors on Smartphones?

https://www.youtube.com/watch?v=K6HgHyPsm_0

Mobile Phone vs Desktop Processors

<https://www.youtube.com/watch?v=l8RC9HyKKQ>

Threads and cores

CPU Cores VS Threads – Explained

<https://www.youtube.com/watch?v=hwTYDQ0zZOw>

Hyper Threading Explained

<https://www.youtube.com/watch?v=lrT9Bl0MCXQ>

Cache

CPU Cache Explained - What is Cache Memory?

<https://www.youtube.com/watch?v=yi0FhRqDJfo>

How Cache works? (Urdu)

https://www.youtube.com/watch?v=g7uIO0fA_oY

Cache Memory Explained : <https://www.youtube.com/watch?v=Zr8WKIOIKsk>

Cache Memory Direct Mapping

<https://www.youtube.com/watch?v=QcAaP5V2Gpc>

10. Understanding Direct Mapping - Computer Organization - Gate

<https://www.youtube.com/watch?v=pSarQQTJbDA>

11. Gate Questions from Direct Mapping - Computer Organization

<https://www.youtube.com/watch?v=3YvPGL16mRg>

13. Understanding Associative Mapping - Computer Organization - Gate

<https://www.youtube.com/watch?v=Pg6bqkekAXY>

14. Understanding Set Associative Mapping - Computer Organization - Gate

<https://www.youtube.com/watch?v=isbdr73Ymug>

15. Gate Questions from Set Associative Mapping - Computer Organization

<https://www.youtube.com/watch?v=wKIvpNcWfVM>

18. Cache Replacement in Direct Mapping - Computer Organization - Gate

<https://www.youtube.com/watch?v=jFd1qvCS6lM>

21. LRU Cache Replacement in Fully Associative Cache - Computer Organization – Gate

<https://www.youtube.com/watch?v=u-dMNYwcVyg>

Mapping functions and page replacement algorithms.

<http://examradar.com/mapping-functions-replacement-algorithms/>

Input and Output

Khan Academy and Code.org | CPU, Memory, Input & Output

<https://www.youtube.com/watch?v=MMzdKTtUIFM>

Direct Memory Access - DMA - Simplified Explanation

<https://www.youtube.com/watch?v=wi-po2SesoE>

Programmed I/O, Interrupt & Direct Memory Access (DMA)

<https://www.louiewong.com/archives/137>

DMA controller | features and Architecture | 8257

<https://www.youtube.com/watch?v=loSqRaAo9r4>

Computer Architecture: Input/Output Organisation

<https://www.studytonight.com/computer-architecture/input-output-organisation>

Programmed input/output

https://en.wikipedia.org/wiki/Programmed_input/output

Direct Memory Access (DMA) in Computer Architecture

<https://www.elprocus.com/direct-memory-access-dma-in-computer-architecture/>

Memory

RAM Explained - Random Access Memory

<https://www.youtube.com/watch?v=PVad0c2cljo>

How Memory works? (Urdu)

<https://www.youtube.com/watch?v=xwpOh8XeUBk>

Binary

Why Do Computers Use 1s and 0s? Binary and Transistors Explained.

<https://www.youtube.com/watch?v=Xpk67YzOn5w>

Virtual Memory

1. Memory Hierarchy - Computer Organization – Gate

<https://www.youtube.com/watch?v=Ou-D8x72xBc>

2. Hit, Hit Ratio and Miss Penalty - Computer Organization – Gate

<https://www.youtube.com/watch?v=cgaZYsnTc04>

What is virtual memory? – Gary explains

<https://www.youtube.com/watch?v=2quKyPnUShQ>

Virtual Memory: 3 What is Virtual Memory?

<https://www.youtube.com/watch?v=qlH4-oHnBb8>

Virtual Memory: 4 How Does Virtual Memory Work?

<https://www.youtube.com/watch?v=59rEMnKWoS4>

Virtual Memory: 5 Page Tables

<https://www.youtube.com/watch?v=KNUJhZCQZ9c>

Virtual Memory: 6 Address Translation

<https://www.youtube.com/watch?v=ZjKS1IbiGDA>

Virtual Memory: 7 Address Translation Example Walkthrough

<https://www.youtube.com/watch?v=6neHHkI0Z0o>

Virtual Memory: 8 Page Faults

<https://www.youtube.com/watch?v=bShqyf-hDfg>

Virtual Memory: 9 Memory Protection

<https://www.youtube.com/watch?v=uDzXXnNy544>

Virtual Memory: 10 Making Virtual Memory Fast

<https://www.youtube.com/watch?v=uyrSn3qbZ8U>

Virtual Memory: 11 TLB Example

<https://www.youtube.com/watch?v=95QpHJX55bM>

Virtual Memory: 12 Multi-level Page Tables

<https://www.youtube.com/watch?v=Z4kSOv49GNc>

Virtual Memory: 13 TLBs and Caches

<https://www.youtube.com/watch?v=3sX5obQCHNA>

Virtual Memory: 14 Summary

<https://www.youtube.com/watch?v=FRvzCrWcFZA>

What is the difference between TLB and MMU in OS?

<https://www.quora.com/What-is-the-difference-between-TLB-and-MMU-in-OS>

What's difference between CPU Cache and TLB?

<https://www.geeksforgeeks.org/whats-difference-between-cpu-cache-and-tlb/>

Difference between Virtual memory and Cache memory

<https://www.geeksforgeeks.org/difference-between-virtual-memory-and-cache-memory/>

Arithmetic and Logic Unit (ALU)

KN Presentation for ALU fixed audio. <https://www.youtube.com/watch?v=Sh-5VcgQDto>

ALU Design

<https://www.youtube.com/watch?v=mOVOS9AigFs>

ALU Heart Of CPU | How Arithmetic Logic Unit Works Explained | Tech Geeks

<https://www.youtube.com/watch?v=bNON-hZALvs>

Arithmetic Logic Unit

<https://www.youtube.com/watch?v=UsK5KV1FPmA>

How Computers Calculate - the ALU: Crash Course Computer Science #5

<https://www.youtube.com/watch?v=1I5ZMmrOfnA>

Registers and RAM: Crash Course Computer Science #6

<https://www.youtube.com/watch?v=fpnE6UAbtU>

What is Register in CPU? (Urdu)

<https://www.youtube.com/watch?v=rZLGow1Vvcw>

Twos complement: Negative numbers in binary

<https://www.youtube.com/watch?v=4qH4unVtJkE>

2's complement | very easy

<https://www.youtube.com/watch?v=7RK3rsfQ8w>

Two's Complement Subtraction Example

https://www.youtube.com/watch?v=vfY7bN_3VKw

Two's Complement Representation and Overflow

<https://www.youtube.com/watch?v=rnQwucEfT6A>

Central Processing Unit : ALU , Control Unit

https://www.youtube.com/watch?v=l_l4Fb7HCh4

How CPU works? (Urdu/Hindi) || How it works?

<https://www.youtube.com/watch?v=Gd7T5c74LuM>

Multiplication

Booth's Algorithm explained in Urdu.

https://youtu.be/Ngr1_7Zy-mA

Booth's Algorithm with Solved Example Part 1

<https://www.youtube.com/watch?v=DHhcnjEKEFo>

Part 2

<https://www.youtube.com/watch?v=ck47MbmwNMc>

Part 3

<https://www.youtube.com/watch?v=QgDDy6DgM5k>

Division

Division (Binary Arithmetic) - Part 1

<https://www.youtube.com/watch?v=F2ZS09T7ofE>

Division (Binary Arithmetic) - Part 2

<https://www.youtube.com/watch?v=BMBAm15kQdI>

Binary Division

<https://www.youtube.com/watch?v=7qPznqr4ndI>

Restoring Division Algorithm for Unsigned Integer

<https://www.youtube.com/watch?v=PzV6gYpVLuc>

Binary Division method (Restoring and Non-restoring Division Algorithm)

<https://www.youtube.com/watch?v=6ToR6vuRb3M>

Tutorial 4 (Division)

<https://www.youtube.com/watch?v=4pABnhvfwfW0>

Division (Binary Arithmetic) - Part 1

<https://www.youtube.com/watch?v=F2ZS09T7ofE>

Division (Binary Arithmetic) - Part 2

<https://www.youtube.com/watch?v=BMBAm15kQdI>

Restoring Division Algorithm for Unsigned Integer

<https://www.youtube.com/watch?v=PzV6gYpVLuc>

Computer science- Binary Representation of Real Numbers | Floating point representation | 2.5

<https://www.youtube.com/watch?v=NeNKiTwP9Vk>

Real Numbers - Floating Point Representation

https://www.youtube.com/watch?v=-MtFG_UF3gY

How to Convert Real number to Binary format

https://www.youtube.com/watch?v=znOd_9O0d2s

Binary 4 – Floating Point Binary Fractions 1

<https://www.youtube.com/watch?v=L8OYx1I8qNg>

Floating Point Numbers - Computerphile

<https://www.youtube.com/watch?v=PZRI1IfStY0>

Floating Point Number Representation in IEEE 754

https://www.youtube.com/watch?v=T_Wxrp-2DZQ

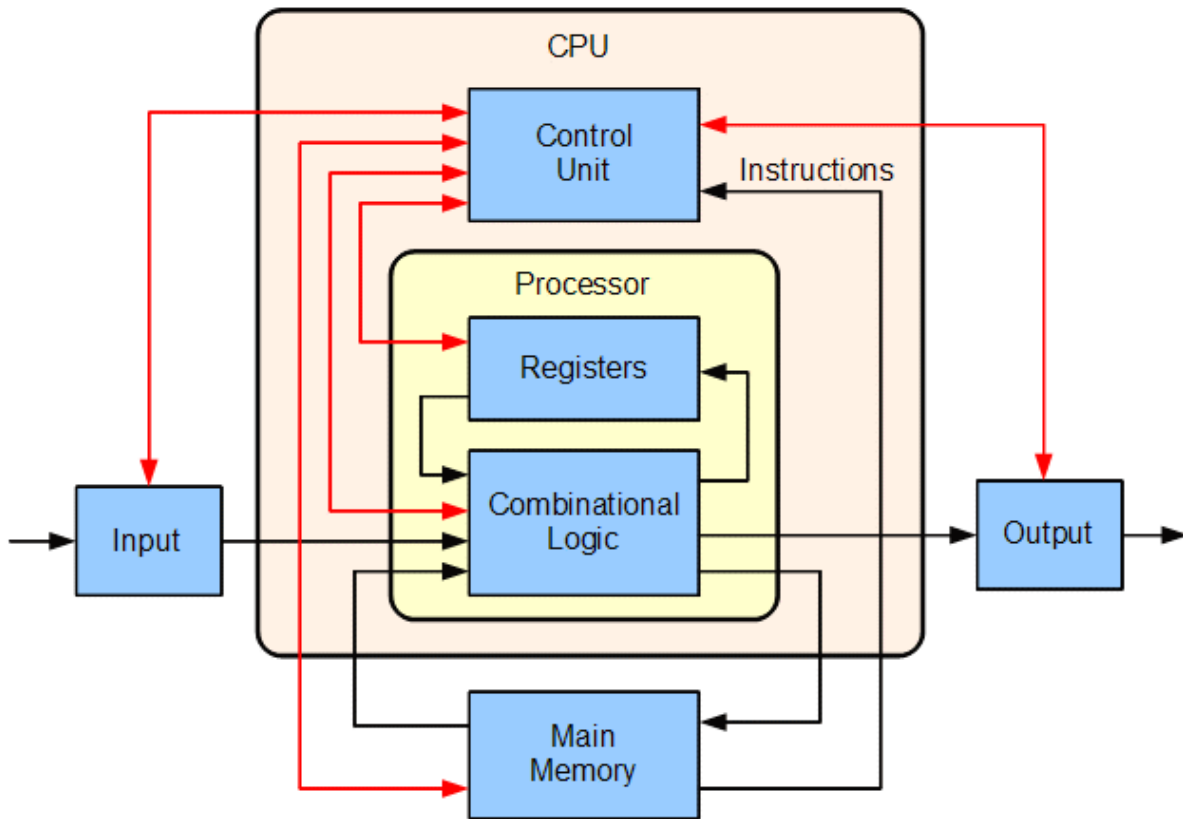
Decimal to IEEE 754 Floating Point Representation

<https://www.youtube.com/watch?v=8afbTaA-gOQ>

IEEE Floating point numbers

<https://www.geeksforgeeks.org/ieee-standard-754-floating-point-numbers/>

Control Unit



Central Processing Unit : ALU , Control Unit

https://www.youtube.com/watch?v=l_14Fb7HCh4

Coding Communication & CPU Microarchitectures as Fast As Possible

<https://www.youtube.com/watch?v=FkeRMQzD-0Y>

CPU Cores VS Threads – Explained

<https://www.youtube.com/watch?v=hwTYDQ0zZOw>

Hyper Threading Explained

<https://www.youtube.com/watch?v=lrT9Bl0MCXQ>

See How a CPU Works

https://www.youtube.com/watch?v=cNN_tTXABUA

How CPU works? (Urdu) ?

<https://www.youtube.com/watch?v=Gd7T5c74LuM>

Design of Control Unit

<https://www.javatpoint.com/design-of-control-unit>

Instruction Execution

Instruction Execution Cycle

https://www.slideshare.net/utsav_shah/instruction-execution-cycle

Sequence of Control Signals

Introduction of Control Unit and its Design

<https://www.geeksforgeeks.org/introduction-of-control-unit-and-its-design/>

Execution of a Complete Instruction – Control Flow

<http://www.cs.umd.edu/~meesh/cm411/CourseResources/CA-online/chapter/execution-of-a-complete-instruction-control-flow/index.html>

Control Unit Operation

<http://aturing.umcs.maine.edu/~meadow/courses/cos335/COA15.pdf>

Hardwired and Microprogrammed Control Unit

Difference Between Hardwired and Microprogrammed Control Unit

<https://binaryterms.com/difference-between-hardwired-and-microprogrammed-control-unit.html>

Computer Organization | Hardwired v/s Micro-programmed Control Unit

<https://www.geeksforgeeks.org/computer-organization-hardwired-vs-micro-programmed-control-unit/>

Difference between Hardwired and Micro-programmed Control Unit | Set 2

<https://www.geeksforgeeks.org/difference-between-hardwired-and-micro-programmed-control-unit-set-2/>

Micro Programmed Control Unit

<https://www.slideshare.net/KamalAcharya/micro-programmed-control-unit>

MicroProgrammed Explained

<https://www.slideshare.net/MuhammadUmar145/microprogrammed-explained>

Input and Output. Programmed and DMA

I/O Interface (Interrupt and DMA Mode)

<https://www.geeksforgeeks.org/io-interface-interrupt-dma-mode/>

I/O Techniques

<http://inputoutput5822.weebly.com/programmed-io.html>

Input/Output

<http://www2.cs.siu.edu/~rahimi/cs401/slides/sh-chap7.pdf>

Compare Interrupt Driven I/O and DMA

<https://www.ques10.com/p/8790/compare-interrupt-driven-io-and-dma-1/>

Different Modes of Transfer: Programmed I/O, I/O Interface Interrupts and Direct Access Memory.

<https://www.faceprep.in/computer-architecture/inout-output-Interface-interrupts-and-direct-access-memory/>

Programmed input–output

https://en.wikipedia.org/wiki/Programmed_input%E2%80%93output

Direct memory access

https://en.wikipedia.org/wiki/Direct_memory_access

I/O and Interface Design

Input/Output

<http://www.ecs.csun.edu/~cputnam/Comp546/Input-Output-Web.pdf>

Computer Architecture: Input/Output Organisation

<https://www.studytonight.com/computer-architecture/input-output-organisation>

Computer Architecture: Input/Output Processor

<https://www.studytonight.com/computer-architecture/input-output-processor>

Computer Architecture: Interrupts

<https://www.studytonight.com/computer-architecture/priority-interrupt>

Error Detection and correction

Parity Check

<https://www.youtube.com/watch?v=pUBdJi6eVYA>

Parity Check and Parity Bits (Error Detection)

<https://www.youtube.com/watch?v=jLuj62Gq-1I>

Hamming code

<https://www.youtube.com/watch?v=2BI7wvmdFE8>

Hamming Code Error Detection and Correction Visualization

<https://www.youtube.com/watch?v=LiGiU7zrLnU>

Hamming Code - Simply Explained

<https://www.youtube.com/watch?v=373FUw-2U2k>

Why RAID is obsolete.

https://www.youtube.com/watch?v=yAuEgepZG_8

Tuesday Tech Tip - Linux RAID vs ZFS RAID

<https://www.youtube.com/watch?v=onpq6qOtsrY>

MD5 Howto

<https://www.youtube.com/watch?v=8QpnFoSAud8>

Hashing Algorithms and Security - Computerphile

<https://www.youtube.com/watch?v=b4b8ktEV4Bg>

CRC Check

<https://www.youtube.com/watch?v=izG7qT0EpBw>

Message Digest, Hash Functions, Working and Operation of MD5

https://www.youtube.com/watch?v=G_qtQgRmiWk

NAS vs SAN - Network Attached Storage vs Storage Area Network

<https://www.youtube.com/watch?v=3yZDDr0JKVc>

What is RAID 0, 1, 5, & 10?

<https://www.youtube.com/watch?v=U-OCdTeZLac>

Computer Evolution

The Evolution of Computing Technologies: From Following Instructions to Learning

<https://www.youtube.com/watch?v=3kj88B0FAyg>

Evolution Of Computers 1936 - 2019

<https://www.youtube.com/watch?v=Jf9vqnMFFgU&vl=en>

Evolution of Laptops (Portable Computers) 1975 - 2020

<https://www.youtube.com/watch?v=MGL047HMxSk>

Read Chapter 2 of Stallings eighth edition text book.

History of transistors and electronics

Birth of The Transistor: A video history of Japan's electronic industry.

<https://www.youtube.com/watch?v=ihkRwArnc1k> (Part 1)

<https://www.youtube.com/watch?v=uGRNXmWng3M> (Part 2)

<https://www.youtube.com/watch?v=ansXGewduN4> (Part 3)

https://www.youtube.com/watch?v=G40YwOg0_B8 (Part 4)

What is a Server? Servers vs Desktops Explained

<https://www.youtube.com/watch?v=UjCDWCeHCzY>

How do hard drives work?

<https://www.youtube.com/watch?v=wteUW2sL7bc>

Quantum Computers (Future architectures)

Flip-flop qubits: a whole new quantum computing architecture

<https://www.youtube.com/watch?v=QpLeWXEGiUc>

Quantum Computing: It's Not Just the Qubits

<https://www.youtube.com/watch?v=bvCbrFD7wdU>

The Race to Harness Quantum Computing and A.I [The Singularity]

<https://www.youtube.com/watch?v=6JeHHf6TtF8>

Quantum Computer in a Nutshell (Documentary)

<https://www.youtube.com/watch?v=0dXNmbiGPS4>

Real quantum computers. Right at your fingertips.

IBM offers access to the most advanced quantum computers for you to do real work.

Learn, develop, and run quantum programs on our systems with the IBM Quantum Experience cloud platform.

<https://quantum-computing.ibm.com/>

Super Computers and High performance computing

Supercomputing in Pakistan

https://en.wikipedia.org/wiki/Supercomputing_in_Pakistan

Sierra Supercomputer: Science Unleashed (Sierra architecture)

<https://www.youtube.com/watch?v=VaOIUs-Yja8>

Top 5

<https://www.youtube.com/watch?v=jhiTmw54m7I>

<https://www.top500.org/lists/>

<https://www.youtube.com/watch?v=OlH5BG9giWI>

<https://www.youtube.com/watch?v=6g3eVfPdBZc>

Other Computer Designs

TTL Computer

<https://www.youtube.com/watch?v=2uXqTi42LI>

How did NASA Steer the Saturn V?- Smarter Every Day 223

<https://www.youtube.com/watch?v=dI-JW2UIAG0>

1958 FACOM 128B Japanese Relay Computer, still working!

<https://www.youtube.com/watch?v=j544ELauus&t=316s>

Relay computer calculates 7 digits of Pi

<https://www.youtube.com/watch?v=bOOCfx2EN10>

"Uptime 15,364 days - The Computers of Voyager" by Aaron Cummings

<https://www.youtube.com/watch?v=H62hZJVqs2o>

Embedded systems and micro controllers

Arduino

An Introduction to the Arduino

<https://www.youtube.com/watch?v=CqrQmQqpHXc>

Raspberry Pi - All You Need To Know

<https://www.youtube.com/watch?v=EKPobkb1N6o>

UDOO BOLT V8 Review & First Look - RYZEN Powered! The Most Powerful SBC Ever

https://www.youtube.com/watch?v=NI9g_NTNLe4

Computer Buses

Computer Buses in general

<https://www.youtube.com/watch?v=VvEikwvyN8k>

The Memory Controller Chip

<https://www.youtube.com/watch?v=OXLY7mrHlaI>

32 bit vs 64 bit

<https://www.youtube.com/watch?v=Wu2A4fpFzgs>

Computer buses in urdu | buses in computer architecture organization in cpu

<https://www.youtube.com/watch?v=NZill3zQc6M>

PGC Lecture: Computer Buses and Types

<https://www.youtube.com/watch?v=aFjroXo1Pw0>

New CXL bus

<https://www.youtube.com/watch?v=RpAshNmpqLQ>

PCI-E

<https://www.youtube.com/watch?v=PrXwe21biJo>

A History of PC Buses - From ISA to PCI Express

<https://www.youtube.com/watch?v=qla-5isbK60>

A Brief History of Buses [Byte Size] | Nostalgia Nerd

<https://www.youtube.com/watch?v=DEiRZWBBwPI>

Motherboards Explained

<https://www.youtube.com/watch?v=b2pd3Y6aBag>

Reliable CAN Bus

<https://www.youtube.com/watch?v=FqLDpHsxvf8>

CAN Bus OBD2

https://www.youtube.com/watch?v=OhShoU_E-0g

Explaining PCIe Slots

<https://www.youtube.com/watch?v=PrXwe21biJo>

Motherboards Explained

<https://www.youtube.com/watch?v=b2pd3Y6aBag>

Memory

How PC Memory has Evolved [Byte Size] | Nostalgia Nerd

https://www.youtube.com/watch?v=C_mj4BaOKPM

RAM Explained - Random Access Memory

<https://www.youtube.com/watch?v=PVad0c2cljo>

SRAM vs DRAM : How SRAM Works? How DRAM Works? Why SRAM is faster than DRAM?

https://www.youtube.com/watch?v=r787m_IaR1I

RAM vs ROM : Difference between them along with their types

<https://www.youtube.com/watch?v=CPOcSGgSxiQ>

CISC vs RISC

Goodbye x86. The FUTURE is RISC-V

<https://www.youtube.com/watch?v=67KW4t42SZk>

RISC vs CISC

<https://www.youtube.com/watch?v=EKgwOAAWZA>

Intel is in serious trouble. ARM is the Future.

<https://www.youtube.com/watch?v=IfHG7bj-CEI>

ARM architecture | Embedded Systems | Lec-9 | Bhanu Priya

<https://www.youtube.com/watch?v=JPfG0UQd3x4>

ARM Processor - Sowing the Seeds of Success – Computerphile

<https://www.youtube.com/watch?v=1jOJl8gRPyQ>

ARM inventor: Sophie Wilson

<https://www.youtube.com/watch?v=jhwWrSaHdh8> (Part 1)

<https://www.youtube.com/watch?v=re5xAqgKqc0> (Part 2)

Repeat students who cannot attend.

Make a list of all of the repeaters. With name, email and roll numbers.

They have to sign a letter stating they cannot come to any class due to clashes and mention which classes are clashing with timings.

The attendance percentage shall be converted into the assignments percentage. So the Assignments shall become 50% and the Attendance shall be 0%.

All those students who sign the letter and send it shall have the second grading method applied.

They also have to agree and write the dates and timings for the midterms and final exams so there is no clash.

Due date for this task is 25 February 2020. All those who do not submit the letter signed by this date shall be in the regular system and clashes shall be discussed only via the univ administration.

For repeat students finalized by 25 Feb 2020

Letter signed by student and admin for not being able to attend due to clash required. Also dates for midterms and finals to be included in the letter to avoid clashes with other mid terms and dates.

Assignments : 50%

Mid Term : 20%

Final : 30%

Attendance : 0%

If anyone has a better idea, you are welcome to explain how it solves the issues better and what the idea is.

On 1/30/20 8:50 PM, Ashhad aziz wrote: Ashhad aziz <ashhadazizyo@gmail.com>

Assalamu alaikum sir Khawar,

Hoping this email finds you well My name is Ashhad aziz EP1750013 i m the "Repeater" of your course Computer Architecture...i saw the marks "%" distribution of your course which is quite better for the regular students but for the repeaters the issue is the attendance here we cant take classes due to our other course classes.

So,i request u to adjust the attendance marks % which is 10% in other formats like adjusting in assignments ,mids or finals would be better option for your convenience or its up to u what ever format u can adjurn. I HOPE U WILL CONSIDER MY REQUEST

"THANKING U IN ANTICIPATION"