Ahsanullah University of Science and Technology
Bangladesh

COURSE OUTLINE

1. Title:**Computer Architecture**

2. Code: **CSE2213**

3. Credit hours: **3**

4. Level: **Level 2, Term 2**

5. Faculty: **Engineering**

6. Department: **Computer Science and Engineering (CSE)**

7. Programme: **Bachelor of Science in Computer Science and Engineering (B.Sc. in CSE)**

8. Synopsis from the Approved Curriculum:

Basic structures and concepts of computer systems: Functional units, Basic operational concepts, Bus structures, Software and Performance; Information representation and transfer; Instructions and data access methods: Registers and Addressing, Program flow control, Logic instructions, Program-controlled I/O, Stacks and subroutines; Control Unit: Hardwired control and Micro programmed control; Memory organization; I/O systems and Interrupts; Introduction to Pipelining, Parallel processing and multiprocessor systems.

9. Type of course (core/elective): **Core**

10. Prerequisite(s) (if any): **Nil**

11. Name of the instructor(s) with contact details and office hours:

Fathima Mirza
Room: 7A01/L
Phone: Extension 516
E-mail: mirza.30194@gmail.com, Fathima.mirza.cse@aust.edu
Office hour: SUN 12:30 – 1:30 PM, WED 10:30 – 11:30 AM

12. Semester Offered: **Fall, 2019-2020**

13. Mapping of Course Outcomes with Bloom's Taxonomy and Programme Outcomes

After successful completion of the course, the student will be expected to:

Sl. No.	Cos	POs	Bloom's Taxonomy		
			C	A	P
1	Comprehend the basics of organizational and architectural issues of a digital computer	1	2		
2	Apply various data transfer techniques in digital computer and analyze processor performance improvement using instruction level parallelism	2	3		
3	Analyze performance issues in processor and memory design of a digital computer	4	4		
4	Evaluate the elements of modern instructions sets and their impact on processor design	5	5		

14. Mapping on COs with Knowledge Profiles, Complex Engineering Problem Solving and Complex Engineering Activities

Course Outcome	Knowledge Profile	Complex Problem Solving	Complex Engineering Activities
CO1	K3		
CO2	K4		
CO3	K8		
CO4	K6		

15. Percentages of Assessment Methods

Method	Percentage
Class Performance	10
Quizzes	20
Final Examination	70

16. Week wise distribution of contents and assessment methods

Week	Topics	Assessment Method(s)
1	***Basic Structure of Computers:*** **Types of a computer, Basic functional units of a computer system, Basic operational concepts, Bus**	

	structures, Performance evaluation: Basic performance equation, Pipelining and superscalar operation, Quantitative measurement of performance; Instruction set architecture: CISC and RISC; Multiprocessor and multicomputer.	
2	***Machine Instructions and Programs:* Representation of numbers, characters and instructions, Signed integer operations and overflow detection, Addressing modes of instructions, Assembly language notations, Basic input/output operations.**	**Quiz 1**
3	**Instruction formats,Program sequencing and branching, Subroutines: Nesting, parameter passing and stack frame; Stack processor organization, Example programs and instructions, Encoding of machine instructions.**	
4	***Input/output Organization:* Accessing I/O devices, Program controlled I/O, Interrupt based I/O: Handling multiple devices, Role of operating system, Processor examples; Direct memory access.**	
5	***Input/output Organization*: Bus arbitration algorithms, Synchronous and Asynchronous Bus, Interface circuits: Serial and parallel ports for input, output and combined I/O operations, Standard I/O interfaces: PCI, SCSI and USB bus standards.**	**Quiz 2**
6	***The Memory System:* Internal organization of semiconductor RAM memory, Static memory, Synchronous and Asynchronous DRAM, Read-only memories, Principles of locality, Memory hierarchy.**	
7	***The Memory System:* Cache memory: Direct mapped, set-associative and fully associative cache, Multi-level cache, Measuring and improving cache performance; Virtual memory.**	
8	***CPU Arithmetic:* Addition and subtraction of signed numbers Carry look-ahead fast adders, Multiplication, Fast multiplication, Booth's algorithm for signed operand multiplication,**	**Quiz 3**
9	**Integer division,Floating-point numbers: IEEE standard representation, Arithmetic operations, Guard bits and truncation**	

10	***Basic Processing Unit:*** **Single bus CPU datapath architecture, Arithmetic and logical operations, Fetching and storing instructions from/to memory, Execution of a complete instruction, Branch instructions, Control sequence of common instructions.**	
11	***Basic Processing Unit:*** **Multiple bus architecture, Hardwired control unit, Micro-programmed control: Microinstructions, Micro-program sequencing, Wide branch addressing; Example of a complete processor.**	
12	***Pipelining:*** **Role of Cache memory, Pipeline performance, Hazards: Examples of data, instruction and structural hazards, Operand forwarding, Handling data hazard in software.**	
13	***Pipelining:*** **Conditional and unconditional branches, Delayed branching, Branch prediction, Data path and control considerations, Superscalar operation, Performance considerations.**	**Quiz 4**
14	**Review classes.**	

17.References

17.1. Required (if any)

1. ***Computer Organization*** **(5th Edition).**
   Authored by:Carl Hamacher, ZvonkoVranesic, SafwatZaky.
   Publisher: McGraw-Hill Education.
2. ***Computer Architecture: A Quantitative Approach*** **(5th Edition).**
   Authored by: John L. Hennessy and David A. Patterson.
   Publisher: Morgan Kaufmann Publishers Inc.

17.2. Recommended (if any)

Prepared by:	Checked by:	Approved by:
Signature: _____ Name: **Fathima Mirza** Department: **CSE** Date:	Signature: _____ Name:**Dr. Mohammad Shafiul Alam** **OBE Program Coordinator, CSE** Date:	Signature: _____ Name: **Professor Dr. Kazi A Kalpoma** HOD, **CSE** Date:

Annex-1: PEO of CSE

PEO1 - Professionalism
Graduates will demonstrate sound professionalism in computer science and engineering or related fields.

PEO2 – Continuous Personal Development
Graduates will engage in life-long learning in multi-disciplinary fields for industrial and academic careers.

PEO3 – Sustainable Development
Graduates will promote sustainable development at local and international levels.

Annex-2: Mapping of PEO-PO

	PEO1	PEO2	PEO3
PO1 - Engineering knowledge: Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems.	√		
PO2 - Problem analysis: Identify, formulate, research and analyze complex engineering problems and reach substantiated conclusions using the principles of mathematics, the natural sciences and the engineering sciences.	√		
PO3 - Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns.	√		
PO4 – Investigation: Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions.	√		
PO5 - Modern tool usage: Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations.	√		
PO6 - The engineer and society: Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice.	√		√
PO7 - Environment and sustainability: Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development.	√		√
PO8 – Ethics: Apply ethical principles and commit to professional ethics, responsibilities and the norms of engineering practice.	√		

PO9 - Individual work and teamwork: Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings.	√	√	
PO10 – Communication: Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions.	√		
PO11 - Project management and finance: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments.	√		
PO12 - Life-long learning: Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change.		√	

Annex-3: Blooms Taxonomy – Revised Version*

Level	Cognitive Domain (C)	Affective Domain (A)	Psychomotor Domain (P)
1	Remember	Receive	Imitate
2	Comprehend	Respond	Execute
3	Apply	Value	Perform
4	Analyze	Conceptualize Values	Adaption
5	Evaluate	Intermalize Values	Neturalize
6	Create		

* References: Dyjur, P. (2018). Writing Course Outcomes