ANDIJAN STATE PEDAGOGICAL INSTITUTE

Lecture materials · 2026–2027 academic year

SUBJECT

Information Systems and Digital Technologies

Lecture 1 · Course Overview and Expectations

Part 1 of 2 · 2 hours

Lecturer: **Ismailov Alisher**

E-mail: alisherismailov1991@gmail.com

Contact: **99-499-73-64**

LECTURE 01 · 2 HOURS · PART 1/2

1

CHAPTER ONE

Fundamentals of Computers

Understanding the Computer

What a computer is · how it evolved · how we classify it

- Input → Process → Output
- Five generations
- Classification
- Applications

WARM-UP

Would your smartphone be considered a computer?

Don't answer yet. First, decide what a computer has to do.

1. Does it take input from a user?
2. Does it process that input with instructions?
3. Does it give back useful information?

LEARNING OBJECTIVES

By the end of this lesson you will be able to…

1. Explain why computer literacy matters for study, work and daily life in the digital age.
2. Describe how this course is organised, how you will be assessed and what is expected of you.
3. Define a computer and explain the input → processing → output cycle in your own words.
4. Identify the main components of a computer and state the function of each.
5. List six characteristics and three limitations of a modern digital computer.
6. Sequence the major manual and automated computing devices in the order they appeared.

01

Course Overview and Expectations

Why computer literacy matters · the 16-week course · how you learn and are assessed

- Computer literacy
- Course map
- Assessment
- Expectations

Why computer literacy matters in the digital age

1 Study

Online courses, e-libraries, learning platforms (Moodle) and research all need digital skills.

2 Work

Teachers, doctors, engineers and farmers all use computers; employers expect these skills.

3 Public services

my.gov.uz, e-tax and online applications save time — if you can use them.

4 Communication

E-mail, messengers and video calls connect you with teachers, colleagues and family.

5 Safety online

Recognise scams and phishing; protect your passwords and personal data.

6 Lifelong learning

Technology changes fast; literate users can learn new tools on their own.

Computer literacy = the knowledge and skills to use computers and technology effectively, safely and responsibly.

COURSE STRUCTURE

The course map: sixteen weeks

1 Course Overview and Expectations	2 Understanding Computer Technology	3 Input and Output Devices	4 Primary Memory
5 Data Storage	6 OS Functions and File Management	7 Application Software and SDLC	8 Midterm Exam
9 Data Security	10 Internet and WWW	11 Communication Tools and Techniques	12 Computing's Impact on Society
13 Staying Current in the Digital World	14 Recap and Future Applications	15 Revision Sessions	16 Final Exam

How you will learn and be assessed

In every lesson

1. **Slides** in English and Uzbek — the key ideas of the topic.
2. **Checks for understanding** — short questions during the lesson.
3. **Interactive activities** — match, order, sort and quiz pages for practice.
4. **Exit ticket** — three questions at the end of each lesson.

How you are assessed

1. **Current assessment:** activities, quizzes and participation every week.
2. **Midterm exam:** week 8, topics 1–7.
3. **Revision:** weeks 14–15, with a practice final exam.
4. **Final exam:** week 16, the whole course.

EXPECTATIONS

What we expect from each other

From you

1. **Come on time** and bring a charged phone or laptop if you have one.
2. **Practise** with the activities after each lesson.
3. **Ask questions** — there are no silly questions.
4. **Be honest** — do your own work; say when you used a source or AI.

From the teacher

1. **Clear goals** at the start of every lesson.
2. **Materials** in English and Uzbek, shared after class.
3. **Feedback** on your activities and exams.
4. **Help** in consultation hours and online.

CHECK FOR UNDERSTANDING

Think – Pair – Share · 3 minutes

Why do YOU need computer literacy?

1

Name two things you did this week that needed computer skills.

Question 1

2

Which week is the midterm exam, and which topics does it cover?

Question 2

3

Name one thing expected from you and one from the teacher.

Question 3

Answers: 1 — e.g. online registration, Telegram, e-mail, searching for information, online banking. 2 — week 8, topics 1–7. 3 — e.g. practise and ask questions; clear goals and feedback.

02

What Is a Computer?

Definition · the input–process–output cycle · components · characteristics and limitations

- Definition & inputs
- Input → Process → Output
- Main components
- Strengths & limits

A computer is an electronic machine

It takes input from the user, processes that input, and generates output in the form of useful information.

A computer accepts input in three different forms

Data

The raw details that need to be processed to generate useful information.

Programs

The set of instructions the computer can execute, in sequential or non-sequential manner.

User reply

The input a user provides in response to a question asked by the computer.

Because its main task is processing, a computer is also called a **data processing unit**, **data processor** or **data processing system**.

Input → Processing → Output

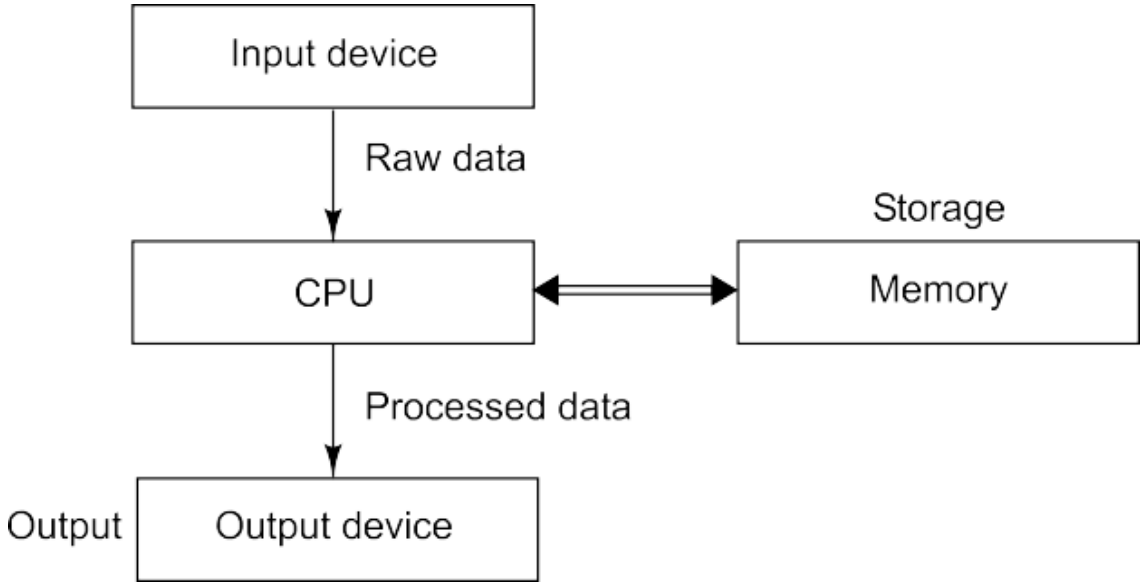


Fig. 1.12 The Input–Process–Output cycle of a computer

The four functions a computer performs

1 Accepting the raw data
Data comes in through an input device such as a mouse or keyboard.

2 Processing the data
The CPU manipulates the data using instructions called programs.

3 Storing the data
Results are held in main memory, or on a hard disk or magnetic disk for later.

4 Delivering the output
Useful information reaches the user through a monitor or printer.

The devices that work as one integrated system

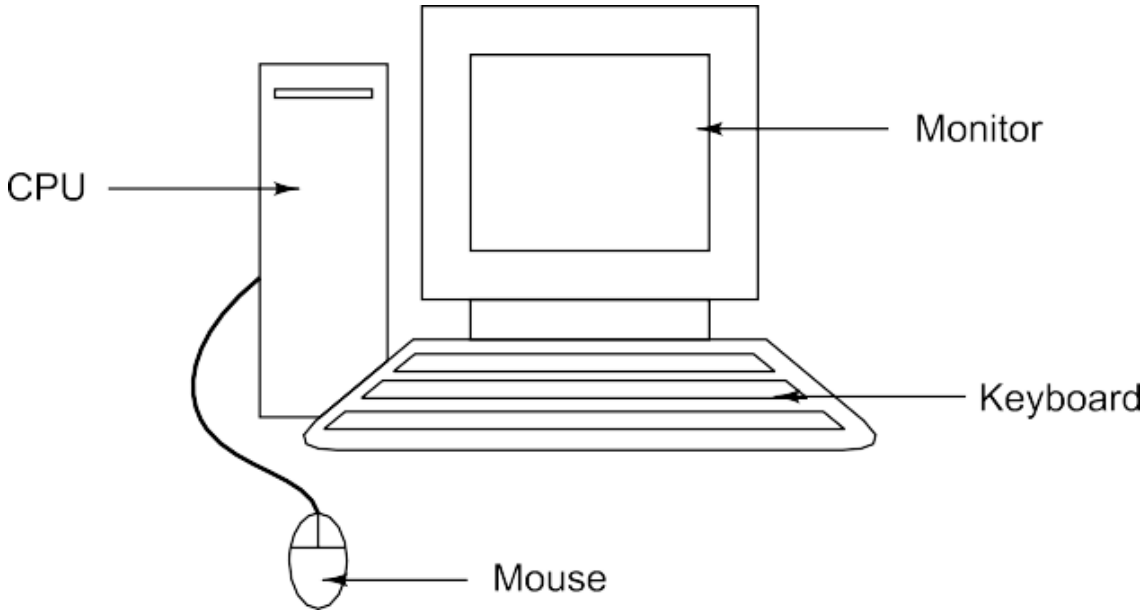


Fig. 1.1 The components of a computer

CPU

Processor

Controls and executes instructions. The most significant component — the “brain” of the computer.

Monitor

Output

A screen that displays information in visual form after receiving video signals from the computer.

Keyboard & Mouse

Input

The devices used by the computer for receiving input from the user.

CHECK FOR UNDERSTANDING

Think – Pair – Share · 3 minutes

Now answer the warm-up: is your smartphone a computer?

1

THINK

Alone, write down the input, the processing and the output of one thing you did on your phone today.

1 minute

2

PAIR

Compare with your neighbour. Where is the CPU in a smartphone? Where is the monitor?

1 minute

3

SHARE

One pair answers: does a phone meet the full definition of a computer? Justify it.

1 minute

Expected answer: yes. It accepts input (touch, voice), processes it with stored programs, stores data, and delivers output on the screen — the same four functions as the machine in Fig. 1.12.

CHARACTERISTICS

Six capabilities that made computers popular

1 Speed

A fast electronic device that solves large, complex problems in a few seconds. Depends on hardware configuration.

2 Storage capacity

Stores huge amounts of data in many formats, in main memory and in secondary storage.

3 Accuracy

Carries out calculations with great accuracy, depending on hardware and the instructions given.

4 Reliability

Produces results with no error. Most errors are human errors created by the user.

5 Versatility

Performs many different tasks and can be used for many different purposes.

6 Diligence

Repeats calculations any number of times with the same accuracy. No tiredness, fatigue or loss of concentration.

LIMITATIONS

Three things a computer cannot do

“Garbage-In, Garbage-Out” (GIGO)

Any wrong instruction, faulty logic or wrong data results in erroneous output.

!

It does only what it is told

A computer is capable of doing only what it is instructed to do. Wrong instructions produce wrong output.

!

It has no common sense

A computer is a dumb machine. Everything it does is the result of human instructions — right or wrong.

!

It cannot judge quality

It can decide from mathematical or logical equations, but not where qualitative considerations are involved.

CHECK FOR UNDERSTANDING

True or False · hands up

True or false? Decide before I reveal the answer.

1

A computer can use common sense to correct an instruction that is obviously wrong.

Statement 1

2

Diligence means a computer can repeat the same calculation many times with the same accuracy.

Statement 2

3

Most of the errors produced by a computer are actually human errors.

Statement 3

Answers: 1 — FALSE, a computer is a “dumb machine” and lacks common sense. 2 — TRUE. 3 — TRUE, which is why computers are described as reliable.

03

Evolution of Computers

From counting on fingers to the first commercial computer

- Before machines
- Manual devices
- Automated devices
- Timeline

BEFORE ANY CALCULATING DEVICE

People counted with whatever was at hand

1

Fingers

Simple addition and subtraction — still used to teach children to count.

2

Stones

Stones represented numbers and were moved to add or subtract.

3

Notches in a stick

Marks cut into wood to record a quantity.

4

Knots in a rope

Knots tied along a rope to represent numbers.

The purpose of every one of these devices was the same: to represent numbers.

These methods were not very fast and not very accurate. That fact led to the invention of the computer, which was developed to produce accurate results at a very fast speed. Early devices were operated manually; later devices were completely automated.

The sand table and the abacus

Sand table

Stones arranged in three channels in the sand; each channel holds a maximum of 10 stones. To add, put one more stone in the right-hand channel. When it is full, clear it and add one stone to the channel on the left.

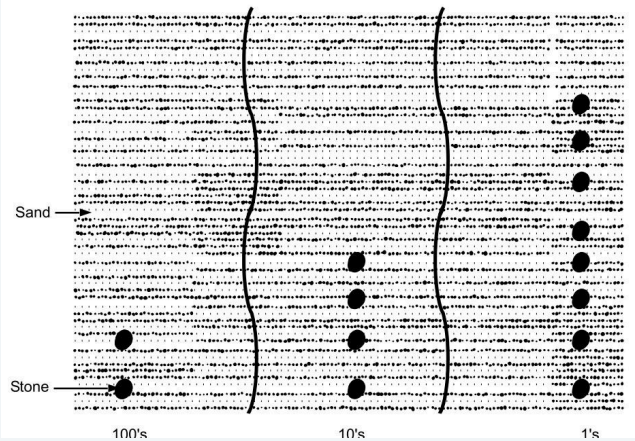


Fig. 1.2 A sand table

Abacus

The sand frame became a wooden frame, the grooves became wires and the stones became beads. Also called a counting frame; popular in Asia Minor around 5000 years ago and still in use in many parts of the world today.

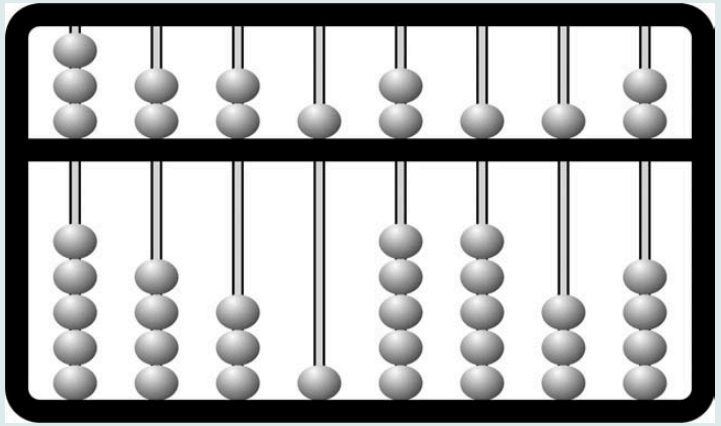


Fig. 1.3 An abacus

Napier bones — built for multiplication

John Napier, 1614

Specially designed for multiplying and dividing numbers.

1. A board whose left edge is divided into 9 squares, holding the numbers 1 to 9.
2. 10 rods made from strips of ivory bone.
3. Multiplication is much faster when one of the two numbers has only a single digit.

Worked example from the textbook: 5437 × 6 = 32622

Read the 6th row of the bones for 5 – 4 – 3 – 7, then add along the diagonals from the right.

bone	5	4	3	7
6th row	3 / 0	2 / 4	1 / 8	4 / 2

- Rightmost digit of the 7-bone → 2
- 1 + 4 + carry 1 → 6
- 8 + 4 = 12 → write 2, carry 1
- 2 + 0 → 2 then 3

Answer: 3 2 6 2 2

Three more devices before automation

1

Slide rule

Edmund Gunter · 1620

Two sets of graduated scales that slide over each other. Built not only for multiplication and division but also for scientific functions such as logarithms, trigonometry and roots.

2

Pascaline

Blaise Pascal · 1642

A calculator also known as a numerical wheel calculator. It contained a set of toothed wheels operated by hand, and was designed to handle numbers up to 999,999.999.

3

Stepped reckoner

Gottfried Wilhelm von Leibniz · after 1642

An improvement on the Pascaline. It was able to perform multiplication and division of numbers as well as the calculation of a square root.

CHECK FOR UNDERSTANDING

Identify the device · call it out

Which manual device am I describing?

1

It arranged stones in three channels in the sand, each channel holding a maximum of ten.

Clue 1

2

Its left edge is divided into 9 squares holding the numbers 1 to 9, and it uses 10 rods of ivory bone.

Clue 2

3

A numerical wheel calculator with toothed wheels, able to handle numbers up to 999,999.999.

Clue 3

Answers: 1 — the sand table. 2 — napier bones (John Napier, 1614). 3 — Pascaline (Blaise Pascal, 1642). Follow-up: which device could also find a square root? (The stepped reckoner.)

Charles Babbage — the father of the modern computer

A professor of mathematics at Cambridge University. In 1812 he decided to automate the repeated series of steps needed to tabulate polynomial, logarithmic and trigonometric functions.

1822

Difference engine

A working model of an automatic mechanical computing machine. In 1823 Babbage made it more automatic still by adding the ability to print the tabulated results.

1833

Analytical engine

The first completely automatic, general-purpose, programmable digital computer — and the first device to use all the features of a modern digital computer. It took almost 3 minutes to multiply two twenty-figure numbers.

- **Input unit**
- **Output unit**
- **Storage unit**
- **Processor**
- **Control unit**

MARK I and Colossus

1937 – 1944

MARK I

Howard Aiken, American mathematician

Designed in 1937 and completed in 1944. It multiplied two twenty-figure numbers in just 6 seconds — far faster than the analytical engine.

- Printed results at one result per 5 seconds
- Noisy and large in size

1944

Colossus

Alan Mathison, British mathematician

The first pure electronic digital programmable computer. It used vacuum tube technology to perform its operations.

- A special-purpose electronic device
- Designed to perform only some specific functions

ENIAC and EDVAC

1946 · ENIAC

Electronic Numerical Integrator And Calculator — a general-purpose electronic digital computer built by John Eckert, John Mauchly and their team at the Moore School of Engineering, University of Pennsylvania. It used vacuum tubes, ran 1000 times faster than MARK I and worked in the decimal number system.

17,468	1,500	70,000	7,200	10,000
vacuum tubes	relays	resistors	crystal diodes	capacitors

Inside ENIAC — a bulky machine built from these parts

1949 · EDVAC

Electronic Discrete Variable Automatic Computer — also invented by John Eckert and John Mauchly, and considered the successor of ENIAC.

Binary number system

It represented and processed values in binary, not decimal.

The stored program principle

The first computer to work on it: programs and data are both stored in memory as strings of binary numbers, so they are indistinguishable inputs.

EDSAC and UNIVAC

1949 · EDSAC

Electronic Delay Storage Automatic Calculator — an early British computer built by Maurice Wilkes and his team at the University of Cambridge Mathematical Laboratory.

Logic circuits	Vacuum tube technology
Memory	Mercury delay lines
Input / output	Punch card and teleprinter
Speed	Only 650 instructions per second — not considered fast

1951 · UNIVAC

Universal Automatic Computer — the first commercial computer, built by the Eckert-Mauchly Computer Corporation

- A bulky computer using 5200 vacuum tubes for its basic logic circuits
- Mercury delay lines used to construct the memory for data and programs
- Processed numbers as well as alphabetic characters efficiently
- Its unique feature: separate processes for input/output and for processing

SUMMARY

Early automated computers at a glance

Machine	Year	Built by	What made it important
Difference engine	1822	Charles Babbage	First working model of an automatic mechanical computing machine
Analytical engine	1833	Charles Babbage	First device to use all the features of a modern digital computer
MARK I	1944	Howard Aiken	Multiplied two 20-figure numbers in 6 seconds
Colossus	1944	Alan Mathison	First pure electronic digital programmable computer (special purpose)
ENIAC	1946	Eckert & Mauchly	General-purpose electronic digital computer; decimal number system
EDVAC	1949	Eckert & Mauchly	First computer to work on the stored program principle; binary
EDSAC	1949	Maurice Wilkes	British computer using mercury delay lines; 650 instructions/second
UNIVAC	1951	Eckert-Mauchly Corp.	First commercial computer; separated I/O from processing

CHECK FOR UNDERSTANDING

Name the machine · write your answers down

Which early computer is being described?

1

The first device that used all the features of a modern digital computer.

Clue 1

2

The first pure electronic digital programmable computer — but only special purpose.

Clue 2

3

The first computer to work on the principle of the stored program.

Clue 3

4

The first commercial computer, sold in 1951.

Clue 4

Answers: 1 — the analytical engine. 2 — Colossus. 3 — EDVAC. 4 — UNIVAC.

EVOLUTION TIMELINE

From stones in the sand to the first commercial computer

MANUAL DEVICES

- **ancient** — Sand table
- **~5000 yrs** — Abacus
- **1614** — Napier bones
- **1620** — Slide rule
- **1642** — Pascaline
- **after 1642** — Stepped reckoner

AUTOMATED DEVICES

- **1822** — Difference engine
- **1833** — Analytical engine
- **1944** — MARK I
- **1944** — Colossus
- **1946** — ENIAC
- **1949** — EDVAC & EDSAC
- **1951** — UNIVAC

Manual devices were operated by hand; automated devices carried out a stored sequence of steps on their own.

REVIEW

Eight questions before we finish

1. Which component of the computer is known as the brain of the computer?
2. Which device arranged stones in three channels in the sand?
3. Who is known as the father of modern digital computers?
4. Which was the first pure electronic programmable computer, developed in 1944?
5. Name the four functions a computer performs.
6. Give three of the six capabilities that made computers popular.
7. What does GIGO mean, and why is it a limitation?
8. Which was the first commercial computer, and in which year?

REVIEW

Answers

1 **CPU**
Central Processing Unit — it controls and executes instructions.

2 **The sand table**
Three channels in the sand, maximum ten stones per channel.

3 **Charles Babbage**
Professor of mathematics at Cambridge University.

4 **Colossus**
Developed in 1944; a special purpose electronic device using vacuum tubes.

5 **Accept, process, store, output**
Accepting the raw data, processing it, storing it and delivering the output.

6 **Any three of the six**
Speed, storage capacity, accuracy, reliability, versatility and diligence.

7 **Garbage-In, Garbage-Out**
Wrong instructions or data always give wrong output — the computer cannot fix them.

8 **UNIVAC, 1951**
The Universal Automatic Computer — the first commercial computer.

EXIT TICKET

Answer these three before you leave

Write your answers on a slip of paper with your name and hand it in at the door.

1

In one sentence, define a computer using the words input, processing and output.

Tests objective 3

2

Name two capabilities and one limitation of a computer.

Tests objective 5

3

Put in order: ENIAC, abacus, UNIVAC, Napier bones.

Tests objective 6

Next: four interactive activities — computer components, the evolution timeline, computer literacy and the course, and the knowledge challenge.