




1

Fundamentals of Computer

Introduction

This chapter introduces the basic concepts of data processing. The difference between data and information is to be convinced to the learners in the context of computer applications. The need for computers and its use as a data processor are to be provided using diverse real life examples. The merits of electronic data processing and the role of computer are to be clarified. The functional units of a computer and a general idea about the internal storage of data are discussed. Maximum care should be given to identify the need of studying this subject and the possibilities of applying computers in their studies and life.

Values and Attitudes:

- ✓ Ability to identify the need of computers and use it for data processing in possible situations
 - ✓ Sharing attitude through collaboration
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Unit Frame

Period : 20

Concepts/Process skills	Process/Activities with Assessments	Learning outcomes
<ul style="list-style-type: none"> • Data and Information <ul style="list-style-type: none"> ✓ Classifying ✓ Identifying ✓ Communicating 	General discussion on data and information using real life examples Preparation of notes	<ul style="list-style-type: none"> • Distinguishes between data and information.
<ul style="list-style-type: none"> • Data processing <ul style="list-style-type: none"> ✓ Identifying ✓ Communicating ✓ Sharing 	Group discussion on different stages of data processing. Preparation of notes Assessment: <ul style="list-style-type: none"> • Group discussion 	<ul style="list-style-type: none"> • Identifies various stages in data processing.
<ul style="list-style-type: none"> • Functional units of a computer <ul style="list-style-type: none"> ✓ Classifying ✓ Identifying 	General discussion on the functional units of a computer. Preparation of notes	<ul style="list-style-type: none"> • Recognises the functional units of a computer
<ul style="list-style-type: none"> • Computer as a data processor <ul style="list-style-type: none"> ✓ Classifying ✓ Identifying 	General discussion on computer as a data processor. Preparation of notes	<ul style="list-style-type: none"> • Explains why the computer is the best electronic data processing machine
<ul style="list-style-type: none"> • Number system <ul style="list-style-type: none"> ✓ Observing ✓ Identifying ✓ Communicating • Importance of binary numbers <ul style="list-style-type: none"> ✓ Observing ✓ Identifying • Importance of octal and hexadecimal number systems <ul style="list-style-type: none"> ✓ Observing ✓ Identifying 	Group discussion on different number systems Preparation of notes General discussion on the importance of binary numbers Preparation of notes General discussion on the importance of octal and hexadecimal numbers Preparation of notes Assessment: <ul style="list-style-type: none"> • Group discussion 	<ul style="list-style-type: none"> • Infers the concept of data representation inside computers. • Explains the formation of numbers in decimal, binary, octal, hexadecimal number systems.
<ul style="list-style-type: none"> • Number conversions <ul style="list-style-type: none"> ✓ Observing ✓ Problem solving ✓ Identifying 	Problem solving on conversion of numbers from one number system to another. Preparation of notes Assessment: <ul style="list-style-type: none"> • Problem solving 	<ul style="list-style-type: none"> • Convert a number from one system to another.

Concepts/Process skills	Process/Activities with Assessments	Learning outcomes
<ul style="list-style-type: none"> • Data representation • Representation of numbers <ul style="list-style-type: none"> ✓ Observing ✓ Problem solving ✓ Identifying 	<p>General discussion on the different types of data and the different ways to represent numbers internally in computer.</p> <p>Preparation of notes</p>	<ul style="list-style-type: none"> • Recognizes various coding system to represent numbers.
<ul style="list-style-type: none"> • Representation of characters <ul style="list-style-type: none"> ✓ Observing ✓ Problem solving ✓ Identifying 	<p>General discussion on the different coding systems to represent characters internally in computer</p> <p>Preparation of notes</p>	<ul style="list-style-type: none"> • Explains various coding systems to represent characters.
<ul style="list-style-type: none"> • Representation of images, audio and video <ul style="list-style-type: none"> ✓ Observing ✓ Problem solving ✓ Identifying 	<p>General discussion on the different methods to represent images, audio and video internally in computer</p> <p>Preparation of notes</p> <p><i>Assessment:</i></p> <ul style="list-style-type: none"> • Problem solving 	<ul style="list-style-type: none"> • Lists various methods to represent images, audio and video.

Towards the Unit:

Data and Information

(1 Period)

Suggested activity: General discussion on data and information using real life examples

- The teacher initiates a discussion by writing some names and numbers on the board and asking the students what they are.
 - Students come up with several answers and teacher introduces the concept of data.
- Teacher then draws columns and rows around the data and gives headings like name, CE, TE, PE, etc.
 - Students now accept this as meaningful and teacher introduces the concept information
- Teacher uses the SSLC marksheet as another instance for introducing data and information and presents the differences between the two
- The teacher concludes the discussion with the following points
 - Data
 - Information
 - Difference between the two

Data processing

(1 Period)

Suggested activity: Group discussion on the different stages of data processing

- Teacher initiates a discussion by asking the students to write the steps they have been through in the plus one admission process.
 - Students write the procedures they had to perform right from preparing the application form.
 - Teacher then groups the students and asks them to consolidate their steps and present them
- Teacher consolidates the steps in data processing.
- The teacher concludes the discussion with the following points
 - Steps in data processing
 - Stresses the use of information as data in other situations
- Instructs the students to prepare notes

Functional units of a computer

(1 Period)

Suggested activity: General discussion on the functional units of a computer

- Teacher asks the students to recollect the different functional units of the computer that they have learnt in their lower classes.
 - Students draw the diagram of functional units and teacher adds the details to the CPU part.
- Teacher consolidates the functions of each unit in detail.
- The teacher concludes the discussion with the following points
 - Diagram of functional units
 - Function of each unit
- Instructs the students to prepare notes

Computer as data processor

(1 Period)

Suggested activity: General discussion on computer as a data processor

- Teacher asks the students to write the features/advantages and limitations/disadvantages of computers.
 - Students individually write the features and limitations of computer.
- Teacher consolidates them after a random presentation by students.
- The teacher concludes the discussion with the following points
 - Features of computer
 - Limitations of computer
- Instructs the students to prepare notes

Number system

(1 Period)

Suggested activity: Group discussion on different number systems

- Teacher asks the students to write decimal numbers upto 30 downwards. After this they write a new series downwards with same numbers but avoiding symbols 8 and 9 as the next column. (i.e., numbers 8,9,18,19, etc. are avoided.). Now they write a new series in

the next column downwards ignoring symbols 2, 3, 4, 5, 6, 7, 8 and 9. (i.e., using symbols 0 and 1 only). Similarly in the next column, a new series with new symbols A, B, C, D, E and F after symbol 9 are written.

- o Students individually write this series.
- o Teacher's intervention and support may be necessary as students may find it difficult to write series for octal and binary.
- o Students may be grouped in benches to complete the task.
- Teacher consolidates the number series presented by students as decimal, octal, binary and hexadecimal respectively after presentation by students.
- The teacher concludes the discussion with the following points
 - o Different number systems
 - o Features of each number system
 - o Construction of number series in each number system
 - o Equivalent values for a number in one number system in other number systems. (can be easily found from each row of the table prepared.)
- Instructs the students to prepare notes

Importance of binary numbers

(1 Period)

Suggested activity: General discussion on the importance of binary numbers

- Teacher introduces computer as an electronic device and asks the students about the main feature of all electronic devices.
 - o Students identify that it has two states ON and OFF.
 - o Teacher connects binary digits to represent the ON and OFF positions.
- Teacher consolidates that data can be represented using binary.
- The teacher concludes the discussion with the following points:
 - o ON and OFF states of an electronic computer can be represented using binary numbers.
 - o Data can be represented in binary form.
- Instructs the students to prepare notes

Importance of octal and hexadecimal number systems

(1 Period)

Suggested activity: General discussion on the importance of octal and hexadecimal numbers

- Teacher discusses the difficulty in representing data as binary (1's and 0's).
 - Students identify chances of errors and problems with debugging.
 - Teacher connects that binary numbers can be converted as octal or hexadecimal as they are powers of 2.
- Teacher consolidates that data can be easily represented using octal or hexadecimal than binary from.
- The teacher concludes the discussion with the following points
 - Data representation using binary is difficult
 - Data can be easily represented using octal or hexadecimal number systems.
- Instructs the students to prepare notes

Number conversions

(5 periods)

Suggested activity: Problem solving on conversion of numbers from one number system to another

- Teacher introduces the importance of base in number conversions and performs decimal to other number systems by continuously dividing the number by the base to which the number is to be converted. The numbers after the decimal part will be continuously multiplied by the base.
 - Students perform number conversions from decimal number system.
- The conversion to decimal number system from other number system is done by multiplying each number by their positional values.
 - Students perform number conversions to decimal number system.
- Teacher introduces the conversions between octal, hexadecimal and binary number systems.
 - Teacher notes that these conversions are very easy and connects

this with the reason for using octal and hexadecimal number system for representing data in computers.

- The teacher concludes the discussion with the following points
 - Number conversions steps
- Instructs the students to prepare notes

Representation of numbers

(3 Periods)

Suggested activity: General discussion on the different types of data and the different ways to represent numbers internally in computer

- Teacher asks the students to list different types of data that can be stored in a computer.
 - Students identify them as numbers(integers & floating point), characters, images, audio and video.
- Teacher reminds the students that data is stored internally in binary form and so all integers have to be stored in that form.
 - Teacher makes the student feel the need for a common format (number of bits) for representing numbers otherwise which we cannot locate where a number starts and ends.
 - Teacher introduces the concept of a word and word length.
- Teacher introduces the different formats for representing integers.
 - Students identify sign and magnitude representation, 1's complement representation and 2's complement representation.
 - The logic behind using 1's complement and 2's complement can be demonstrated to students using a simple binary subtraction (101 - 011). This problem can be converted to an addition problem using the above two methods. (2's complement as 101+101(2's comp. of 011) which gives 010 as the answer.
- Teacher introduces the format for representing floating point numbers.
- The teacher concludes the discussion with the following points
 - The different number representation techniques
- Instructs the students to prepare notes

Representation of characters

(5 Periods)

Suggested activity: General discussion on the different coding systems to represent characters

- Teacher initiates a discussion by asking the students how the character 'A' can be stored in a computer.
 - Students identify the need to convert these symbols as binary, as computers store data in binary format.
 - They understand the need for coding characters into binary.
- The different character coding formats are introduced by the teacher along with its features.
 - The teacher demonstrates the codes for some commonly used characters in ASCII, EBCDIC and Unicode.
- The teacher concludes the discussion with the following points:
 - Different character coding formats
- Instructs the students to prepare notes

Representation of images, audio and video

(5 Periods)

Suggested activity: General discussion on the different methods to represent images, audio and video internally in computer

- Teacher initiates a discussion by asking the students how images, audio and video can be stored in a computer.
 - Students identify the need to convert them as binary, since computers store data as binary.
- The different formats for storing images, audio and video are introduced by the teacher along with its features.
- The teacher concludes the discussion with the following points
 - Different images, audio and video coding formats
- Instructs the students to prepare notes

Process Assessment

- Group discussion on data processing and number systems
- Problem solving skills in number conversions

Portfolio Assessment

- Activity log book
- Worksheets

Unit-wise Assessment

1. Written tests may be conducted with questions similar to those given in worksheets.
2. Group Quiz may be conducted by the learners themselves as follows:
 - i. The learners are divided into 4 groups (adjacent benches)
 - ii. Each group prepares questions. Group leader ensures that all the members in the group participate in preparing questions and their answers. The questions are consolidated within the group.
 - iii. The quiz is conducted by ensuring the participation all the learners. Teacher should interfere in time for ensuring the unit-wise assessment of all the learners.
3. Remediation may be planned, if needed, for the topics for which the learning outcome(s) are not attained.

TE Questions

1. Given below is some data. Convert this into information and compare the two
39, Sunil, 23/09/1999
2. What is the relevance of hexadecimal system in computers?
3. Fill in the blanks
(123)₈, (____)₈, (133)₈, (137)₈
4. Arrange the following numbers in the ascending order of their value in decimal number system.
(23)₈, (67)₁₀, (16)₁₆, (10010)₂
5. Write the following decimal number in binary, sign and magnitude form, one's compliment and 2's compliment form.
a. (25)₁₀ b. (-40)₁₀

6. Consider that you are filling the application for higher secondary admissions and you are entering your name as part of it. What is the method that computer uses to represent your name internally? Explain.
7. Explain the different stages of data processing in relation with the higher secondary admission process.
8. The following are some stages in data processing that occur in a bank while a Demand Draft (DD) is prepared for a customer. Arrange them in proper order.
 - a. The details of DD is used by bank for preparing annual reports
 - b. The details in the application form is entered into the computer by clerk
 - c. The DD is printed and given to the customer
 - d. The manager approves the DD application
 - e. The DD application form is filled by the customer
 - f. The DD details is saved in the bank's computer
9. Given below are a few numbers whose number systems are not known. Write all the possible number systems each number can belong to.
 - a. 1011
 - b. 649
 - c. 567
 - d. 989
10. Consider the number 25.45. write the mantissa and exponent part of this number when written in floating point notation
11.
 - a. Name the encoding scheme for encoding characters that was developed by Department of Electronics, Govt. of India.
 - b. What was the purpose of this encoding scheme? Write its features.

Scoring Indicators

1. Roll No 39, Sunil was born on 23/09/1999. Features of data and information
2. Representing numbers and operations in binary form requires too many bits and needs lot of effort. Binary can be easily converted to hexa. Therefore this short-hand notation is widely used in the design and operations of electronic circuits.
3. $(127)_8$

4. $(10010)_2$, $(23)_8$, $(16)_{16}$, $(67)_{10}$
5. a. $(11001)_2$, $(00011001)_2$, $(00011001)_2$, $(00011001)_2$
b. $(101000)_2$, $(10101000)_2$, $(11010111)_2$, $11011000)_2$
6. Unicode, features
7. Explain 6 stages
8. e, b, f, d, c, a
9. a. binary, octal, decimal, hexa
b. decimal, hexa
c. octal, decimal, hexa
d. decimal, hexa
10. mantissa: 0.2545, exponent: 2
11. a. ISCII
b. encoding scheme for representing various writing systems of India. Uses 8-bits, adopted by the Bureau of Indian Standards (BIS). Now replaced by Unicode.

Assessment Worksheet - 1.1

1. Unprocessed collection of facts is called _____
2. All number systems have ____ and ____ digits.
3. Calculations and comparisons are happening in the _____ unit of CPU.
4. The MSD of the binary number 1000.010 is_____.
5. The number system which uses the letter 'F' as one of its symbols is _____.

Components of the Computer System

Introduction

This unit at the beginning provides the learners with basic knowledge of data processing and the various functional units involved in the process of data processing. At this stage the learner should be able to describe the role of each functional unit and their importance in processing. In the next stage the hardware used for each functional units like processors, memory, input devices and output devices are to be discussed in detail. As a result the learner will be able to distinguish them based on their uses and features. The next section e-Waste provides the learners, knowledge of what is e-Waste, its hazards and its disposal methods. It also discusses the role of students in e-Waste disposal. This section should be handled with great importance as it could improve the morale and good attitudes in learners. This unit also discusses the concept of green computing with stress on how to make computers green. In the software section the learners are to be provided with knowledge of system software and application software in detail. Provision should be given for hands on experience on various software packages and utilities. The concept of free and open source software and proprietary software, freeware, shareware and human-ware are also discussed for analysis and interpretation by the learners.

Values and Attitudes

- ✓ Ability to solve problems of life with innovative ideas and utilize the experience for the benefit of the society.
- ✓ Judges the environmental and health hazards due to e-Waste and appraises the need of e-Waste disposal.
- ✓ Appraises the energy star concept and becomes a promoter of green computing.
- ✓ Ability to judge the pros and cons of free software and proprietary software.

Unit Frame

Period : 35

Concept / Idea and Process skills	Process/Activities with Assessments	Learning outcomes
<ul style="list-style-type: none"> • Hardware ✓ Observing ✓ Understanding ✓ Classifying ✓ Analysing 	<p>A discussion followed by a power point presentation of various components of computer system.</p> <p>Demonstration of actual motherboard with processor and memory.</p> <p>Assignment on input/output devices.</p> <p>Demonstration of available devices.</p> <p>Illustration, Table preparation,</p> <p><i>Assessment:</i> Worksheet Self check questions</p>	<p>Identifies microprocessor and list registers.</p> <p>Distinguishes various types of memory and list their importance.</p> <p>Distinguishes different types of input/output devices based on their uses and features.</p>
<ul style="list-style-type: none"> • e-Waste & Green Computing ✓ Understands ✓ Identifies ✓ Interprets ✓ Judges 	<p>General discussion on Green computing concepts.</p> <p>Discussion on steps that can be adopted to make computers green.</p> <p>Demonstration of various settings available in computer to make computer green.</p> <p>Illustration, Preparation of notes.</p>	<p>Recognises the importance of e-Waste disposal and the learner's role in its disposal.</p> <p>Explains the concept of green computing</p>
<ul style="list-style-type: none"> • Software ✓ Understanding ✓ Classifying ✓ Discussing ✓ Identifying ✓ Categorizing 	<p>General discussion on software and its classification.</p> <p>Discussion on operating system and its functions.</p> <p>Demonstration of different operating systems.</p> <p>Discussion on different application software.</p> <p>Demonstration of different application software.</p> <p>Discussion on Computer languages.</p> <p>Demonstration of compilation/interpretation process.</p>	<p>Distinguishes between system software and application software</p> <p>Recognises the need and functions of an operating system.</p> <p>Classifies various language processors and recognise their need.</p> <p>Lists the uses of different types of utility software.</p>

Concepts/Process skills	Process/Activities with Assessments	Learning outcomes
	<p>Discussion on utility software.</p> <p>A group discussion on free and open source software is conducted.</p> <p>A group discussion is conducted to list the different free and open source software.</p> <p>Discussion on freeware and shareware.</p> <p>Comparison between freeware and shareware with suitable examples</p> <p>Conducts a debate on open source and free software with proprietary software.</p> <p>Table preparation</p> <p><i>Assessment:</i> Lab work Preparation of questions Preparation of notes</p>	<p>Distinguishes and lists the use of word processor, electronic spread sheets and presentation software.</p> <p>Explains the importance of open source concepts</p> <p>Distinguishes between freeware, shareware and proprietary software.</p> <p>Lists the advantages of freeware and shareware.</p>
<ul style="list-style-type: none"> • Humanware or Liveware. ✓ Identifying ✓ Interpreting ✓ Concluding 	<p>General discussion on humanware or liveware.</p> <p>Classification of humanware with job description.</p> <p>Illustration, Preparation of notes</p>	<p>Explains the term humanware or liveware.</p>

Towards the Unit:

Computer Memory

(1 Period)

Suggested activity: Seminar

- The teacher divides the students into 5 groups and each group is given task of presenting a seminar on different types of memory..
- Each group has to prepare a presentation on the type of memory assigned
- The seminar should
 - o list registers/primary memory/secondary memory and their uses.
 - o differentiate between functions of registers, primary and secondary memory.
 - o illustrate the need for registers and cache memory.
 - o compare the cost of different memories.
- The students in other group can clear their doubts after the seminar. The teacher is expected to support the presenter with additional information, if needed.
- This activity provides involvement of each student in the group for the activity and a facility for teachers to evaluate the involvement of each student in the group for process assessment.
- The teacher concludes the seminar pointing to the advantage and disadvantage of using different types of memory.
- Each student in a group has to submit the seminar report for the portfolio.

Inout Output Devices

(1 Period)

Suggested activity: Assignment on input/output devices

- The teacher after completing general discussion on input/output devices, learners are asked to write an assignment.
- Different problems are given for each student or groups of three or five students.
 - o Each group is given with name of an office/shop/institution. (For example bank, supermarket, school, studio etc.)

- o Each group has to
 - list the input/output devices needed by the office/shop/institution.
 - justify the purpose of selecting the devices.
 - illustrate their functioning.
- o Assignment is prepared in the Activity log book. The same may be collected in digital form prepared using word processing software. The product may be submitted through e-mail or print-out. This ensures the ICT skills of the learners.

e-Waste

(1 Period)

Suggested activity: General discussion and preparation of notes on green computing

- The teacher writes the following statement on blackboard or a chart.
 - o “Many of the technologies we use every day consume more power and resources than they really need”.
 - o Learners are asked to analyse the statement and a discussion is done.
- The teacher writes the following statement on blackboard or a chart.
 - o Should we use recyclable materials for manufacturing computer key board or cabinet? Why?
 - o Learners are asked to analyse the statement and a discussion is done.
- Then the teacher discusses the concept of green computing and the learners recognise the importance of green computing and prepare notes on it.

Freeware and Shareware

(1 Period)

Suggested activity: Debate and preparation of notes.

- The teacher after discussing what is freeware and shareware/proprietary software, initiates a debate whether freeware and shareware / proprietary software is better.

- o The two sides of the class lists out the advantages and disadvantages.
- This activity consists of the involvement of all students in the class.
- The teacher concludes the discussion with the following points
 - o Lists out the advantages and disadvantages
 - o Instructs the students to prepare notes.

Process Assessment

- Group discussion on various components of computer.
- Seminar on memory.
- Assignment on input/output devices
- Group discussion on various types of software
- Debate on free and proprietary software.

Portfolio Assessment

- Activity log book
- Assignment
- Seminar report
- Assessment worksheets

Unit-wise Assessment

- Class test
- Quiz
- Question preparation

TE Questions

1. Pick the odd one out
a) Hard Disk b) DVD c) RAM d) Floppy disk
2. What will happen if RAM is not present in the computer?
3. What will happen if ROM is not present in the computer?
4. Raju is planning to set up DTP centre. Suggest a suitable printer for him with justification.

4. Match the following:

A	B
RAM	Interface between user and hardware
OMR	Heat sensitive paper
Operating System	Objective type Exam
Thermal printer	BIOS
ROM	Volatile

6. Suggest suitable devices for the following situations:
- To use in super markets for identifying products which make billing easier?
 - To capture information, like pictures or text, and convert into a digital format that can be edited using computer.
7. What is the need for a compiler / interpreter?
8. What is e-Waste? Explain its disposal methods.
9. Explain student's role in e-Waste management.
10. Can the computer go green? How?
11. A computer after continuous use for two to three years became slightly slow? Point out a reason that can be associated with hard disk and give a suitable remedy?
12. How can we protect a computer from virus?
13. Classify the following softwares into groups and name the groups?
MS word, Windows XP, Open office, Pascal, MS Excel, Winrar, Linux, C++, MySQL, Adobe Flash, Winzip
14. Can a computer function without an operating system? Why?
15. Out of free software, open source software and proprietary, which is better? Why?
16. Distinguish freeware and shareware.
17. List any three humanware with job description?

Scoring Indicators

1. RAM
2. Computer becomes slower.
3. Problem with loading OS.
4. Laser Printer, 2 Justification points
5. RAM- Volatile, OMR- Objective type Exam, Operating System- Interface between user and hardware, Thermal printer- Heat sensitive paper, ROM- BIOS
6. a. Barcode reader, b. scanner and OCR.
7. Conversion from HLL to Machine language.
8. Definition, 3 disposal methods
9. Recycle, Reuse, stop buying unnecessary equipments, visit manufacturers website before buying
10. Yes; two supporting points.
11. Defragmentation and its definition
12. Antivirus software; Two Software names
13. Classify under System software and Application software
14. No, Process, device, memory and file management is done by OS.
15. Selection with justification.
16. Any two points
17. Any three humanware.

Assessment Worksheet - 2.1

1. EEPROM stands for _____.
2. _____ is an example of optical storage device
3. Compare RAM and ROM.
4. List any three input devices
5. _____ holds the address of the next instruction to be executed by the processor

Assessment Worksheet 2.2

1. What is e-Waste?
2. List the toxic materials present in e-Waste.
3. The study and practice of environmentally sustainable computing is called _____.
4. One of the earliest initiatives towards green computing was the voluntary labeling program known as _____.
5. What is incineration? What do you mean by 'Green design'?

Assessment Worksheet 2.3

1. _____ is an interface between user and computer hardware.
2. List any two functions of operating system.
3. Match the following:

A	B
Language processor	Disk defragmenter
Utility software	Linux
High level language	Compiler
Operating system	Humanware
Database Administrator	C

4. _____ is an example of free and open source software.
5. _____ is an example of proprietary software.
6. What is Humanware? Give an example.