LEARNING OBJECTIVE

1. To gain hands-on experience on hardware and coding.

2. To learn about the process of analyzing a problem and find solutions.

3. To understand the role of algorithm and flowcharts in problem analysis and solutions.

4. To know about the process of prototyping through the principles of sensor and sensor based data processing.
WHAT IS COMPUTATIONAL THINKING?

- An approach to breaking down complex problems,
- Understand what the problem is &
- Develop possible solutions using various tools & techniques
FOUR KEY TECHNIQUES OF COMPUTATIONAL THINKING

1. Decomposition - breaking down a complex problem or system into smaller, more manageable parts

2. Abstraction – focusing on the important information only, ignoring irrelevant detail

3. Pattern Recognition – looking for similarities among and within problems

4. Algorithms - developing a step-by-step solution to the problem, or the rules to follow to solve the problem
NOW LETS FOCUS ON

- Developing a step-by-step solution to the problem with Algorithms & Flowcharts
- Getting introduced to Hardware/Software - understand their usage
- Learning the basic concept of Programming
HOW TO APPLY COMPUTATIONAL THINKING

Think about steps need to solve a problem

Apply technical skills to make computer solve a problem

Arrive at the solution
An **algorithm** is a set of step by step instructions to solve a problem.

For example, a computer program, mathematical calculations etc.

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For example, a recipe for baking a cake is an algorithm.

- Melt chocolate and butter
- Stir sugar into melted chocolates
- Add two **eggs** and add flour
- Bake it for 40 minutes
- Cool it in a pan before eating.
A **flowchart** is a diagrammatic representation of an algorithm, workflow or process.

This graphical representation can help in understanding a problem.

### Some of the symbols used in flowcharts

<table>
<thead>
<tr>
<th>Name</th>
<th>Symbol</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Start/End</td>
<td><img src="image" alt="Oval" /></td>
<td>An oval represents Start and End in the flowchart</td>
</tr>
<tr>
<td>Arrow</td>
<td><img src="image" alt="Arrow" /></td>
<td>An arrow line is a connector that shows relationship between the shapes</td>
</tr>
<tr>
<td>Input / Output</td>
<td><img src="image" alt="Parallelogram" /></td>
<td>A parallelogram represents the input/output for the system</td>
</tr>
<tr>
<td>Process</td>
<td><img src="image" alt="Rectangle" /></td>
<td>A rectangle represents a process</td>
</tr>
<tr>
<td>Decision</td>
<td><img src="image" alt="Diamond" /></td>
<td>A diamond indicates a decision</td>
</tr>
</tbody>
</table>
Example 1: Find the average of two numbers

Algorithm:

Input: two numbers x and y
Output: the average of x and y

Step 1: input x, y
Step 2: sum=0, average=0
Step 3: sum = x + y
Step 4: average = sum / 2
Step 5: print average
Example 2: Find the maximum of two numbers

Let A and B be two integer number

Algorithm:

Step 1: input A,B

Step 2: compute the maximum number
  If A is greater than B, then A
  is the greater number else B
  is greater number

Step 3: print maximum number
Example 3: Find the area of a rectangle

Let \( W = \text{width} \)
\( L = \text{length} \)
\( A = \text{area of rectangle} \)

Algorithm:

Step 1: input \( W, L \)
Step 2: \( A = W \times L \)
Step 3: print \( A \)
Example 4: A simple flowchart, which shows what to do, when a lamp does not work

Algorithm:

Step 1: plug in the lamp

Step 2: check the bulb

If bulb is burned out, then replace bulb else repair lamp
Example 5: Buying a chocolate from the market

Algorithm:

Step 1: Think of chocolate you like
Step 2: Visit a shop
Step 3: Pay shopkeeper
Step 4: Buy chocolate
Step 5: Return home

Diagram:

Start

Do you want to buy chocolate?

Yes
- Go to Store
  - Pay Shopkeeper
  - Take chocolate
  - Get out of store
  - End

No
- Stay at Home
Example 6: Design a flowchart for making sandwich

Algorithm:
Step 1: Get a slice of bread
Step 2: Spread butter on bread
Step 3: Spread vegetables on bread
Step 4: Eat Sandwich
Example 7: To open a can of dog food

Algorithm:
Step 1: Get the can and the can-opener
Step 2: Place can inside jaws of can-opener
Step 3: Close jaws
Step 4: Turn handle on can opener
Step 5: Keep turning until the can has made a complete circle
Step 6: Open the jaws of the opener
Step 7: Remove the can from the can-opener
Example 8: Design a flowchart for traffic light scenario

A good driver will always follow the traffic laws. Let us assume you are a car driver starting from your home and approaching the traffic light. Design a flowchart for the traffic light rules.

Algorithm:

Step 1: Start from your place and approach the light

Step 2: Check for the color of the light

Step 3: The decision is to be made on the bases of light color if color is

- Red: Prepare to stop
- Yellow: Slow down
- Green: Continue driving
Exercise 1: Write missing steps to complete the algorithm to find minimum of two integers

Let A and B be two integer number

Algorithm:

Step 1: input A,B

Step 2: Compute the minimum number

   If A is smaller than B
   then A is the smaller number
   else B is smaller number

Step 3: Print minimum number
Exercise 2: Design a flowchart for the ATM system for withdrawal of cash based on the algorithm defined below

Suppose you went to the ATM to withdraw the amount

Algorithm:

Step 1: Insert the ATM card into the ATM slot and remove

Step 2: Input PIN of ATM card

Step 3: Select option of withdrawal

Step 4: Input amount to be withdrawn
THANK YOU