

Institute of Computer Technology
B. Tech. Computer Science and Engineering
Sub: DS
Course Code: 2CSE302

Practical – 21

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Sem - 3
Branch: CS
Class: A
Batch: 32

Imagine you're organizing books on a shelf by their publication year in ascending order. You pick up each book one by one and place it in its correct position relative to the books already sorted on the shelf.

Each time you add a book to the sorted part of the shelf, you may need to shift some already-sorted books to make space. This is similar to how Insertion Sort works, where each element is picked from the unsorted portion and placed in its correct position in the sorted portion.

Code:

```
#include <stdio.h>

void insertionSort(int arr[], int n) {
    int i, j, key;

    printf("Initial Array:\n");
    for (i = 0; i < n; i++) {
        printf("%d ", arr[i]);
    }
    printf("\n");

    // Insertion Sort Algorithm
    for (i = 1; i < n; i++) {
```

```
    key = arr[i]; // Element to be inserted into the sorted portion
    j = i - 1;

    // Shift elements of the sorted portion to the right to make space
    while (j >= 0 && arr[j] > key) {
        arr[j + 1] = arr[j];
        j--;
    }

    arr[j + 1] = key; // Place the key in its correct position

    // Print the array after each step
    printf("Step %d:\n", i);
    for (int k = 0; k < n; k++) {
        printf("%d ", arr[k]);
    }
    printf("\n");
}

printf("Sorted Array:\n");
for (i = 0; i < n; i++) {
    printf("%d ", arr[i]);
}
printf("\n");
}

int main() {
    int arr[] = {2021, 2019, 2020, 2018, 2022};
    int n = sizeof(arr) / sizeof(arr[0]);

    insertionSort(arr, n);

    return 0;
}
```

Output:

```
PROBLEMS  OUTPUT  DEBUG CONSOLE  TERMINAL  PORTS  SERIAL MONITOR  COMMENTS
[Running] cd "c:\ICT\SEM-3\DS\Practical\Practical-21\" && gcc main.c -o main && "c:\ICT\SEM-3\DS\Practical\Practical-21\main
Initial Array:
2021 2019 2020 2018 2022
Step 1:
2019 2021 2020 2018 2022
Step 2:
2019 2020 2021 2018 2022
Step 3:
2018 2019 2020 2021 2022
Step 4:
2018 2019 2020 2021 2022
Sorted Array:
2018 2019 2020 2021 2022

[Done] exited with code=0 in 0.791 seconds
```