COURSE HANDOUT

Course Code	ACSC13
Course Name	Design and Analysis of Algorithms
Class / Semester	IV SEM
Section	A-SECTION
Name of the Department	CSE-CYBER SECURITY
Employee ID	IARE11023
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Topic Covered	Worst case, best case, and average case time analysis
Course Outcome/s	Determine the time complexity of an algorithm in worst case, best case, and average cases
Handout Number	11
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Content about topic covered: Worst case, best case, and average case time analysis

Worst case

“The worst-case complexity of an algorithm is the highest number of steps that can be taken on any instance of size n. It's an illustration of the curve that goes through the peak of every portion.”

Best Case

“The algorithm's best-case complexity is the function defined by the fewest number of steps needed for every case of size n. It shows the path going through the lowest position in each column.”

Average Case

“the algorithm's average-case complexity is the function that describes the average number of steps it takes to solve a problem of size n.”

Example:

```
ALGORITHM SequentialSearch(A[0..n − 1], K)
    //Searches for a given value in a given array by sequential search
    //Input: An array A[0..n − 1] and a search key K
    //Output: The index of the first element of A that matches K
    //        or −1 if there are no matching elements
    i ← 0
    while i < n and A[i] ≠ K do
        i ← i + 1
    if i < n return i
    else return −1
```

Determine the time complexity of a sequential search algorithm in three cases

Worst case: key element is found at last iteration in sequential (or linear search algorithm)

Best case: key element is found at early iterations of sequential search algorithm

Average case: key element is found at intermediate steps of an algorithm.

Based on these cases, finally, time complexity is derived in all three cases as follows:

Case	Total Comparisons
Worst case	n key comparisons
Best case	1 comparison
Average case	(n+1)/2

- Total number of elements in array are n