

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	Space complexity and examples
Course Outcome/s	Find the space complexity of an algorithm
Handout Number	8
Date	31 March, 2023

Content about topic covered: Space complexity

Space Complexity

The amount of memory an algorithm requires to function that is referred to as its space complexity. Any algorithm P's space complexity is given by $S(P)=C+SP(I)$, where C is constant.

- Fixed Space Requirements (C)
Independent of the characteristics of the inputs and outputs
 - ✓ It includes instruction space
 - ✓ space for simple variables, fixed-size structured variable, constants
- Variable Space Requirements ($S_p(I)$)
depend on the instance characteristic I
 - ✓ number, size, values of inputs and outputs associated with I
 - ✓ recursive stack space, formal parameters, local variables, return address

Example 1:

```
Algorithm  add (a,b,c)
{
  \\ a,b,c are floating type
  Return a+b+c;
}
```

In the above algorithm a,b and c allocate one word size then the total size is “3”, $C=3$, $SP(I)=0$

$$\therefore \text{Space complexity } S(P) = 3 + 0 = 3$$

Example 2:

Algorithm add1 (x1,n)

```
{  
    \\ Sum1 and x1[i]  
    Sum1 = 0.0  
    for I =1 to n do  
        sum1 =sum1+x1[i];  
    return sum1;  
}
```

In the above algorithm ‘n’ space for x1[], one space for ‘n’ one space for ‘i’ and one space for “sum1”

∴ The space complexity of above algorithm is

$S(p)=n+3$
