



**Department of Computer Science and Engineering,
PES University, Bangalore, India**

**Lecture Notes
Problem Solving With C
UE24CS151B**

***Lecture #2
Problem Solving using Strings***

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Unit #: 3**Unit Name: Text Processing and User Defined Types****Topic: Problem Solving using Strings**

Course objectives: The objective(s) of this course is to make students

- Acquire knowledge on how to solve relevant and logical problems using computing Machine.
- Map algorithmic solutions to relevant features of C programming language constructs.
- Gain knowledge about C constructs and its associated ecosystem.
- Appreciate and gain knowledge about the issues with C Standards and its respective behaviours.

Course outcomes: At the end of the course, the student will be able to:

- Understand and Apply algorithmic solutions to counting problems using appropriate C Constructs.
- Understand, Analyze and Apply sorting and Searching techniques.
- Understand, Analyze and Apply text processing and string manipulation methods using Arrays, Pointers and functions.
- Understand user defined type creation and implement the same using C structures, unions and other ways by reading and storing the data in secondary systems which are portable.

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Solve the below programs using C Strings.

Link for Solution:

https://drive.google.com/file/d/1O0NUhfgazV1JCo2_KN8Of03Hw-b2TNUx/view?usp=drive_link

Level-1: Banana

1. At a university freshers' event, students are excitedly picking up their name tags. However, the event staff realizes that some names are jumbled! To ensure everyone's name is displayed correctly, they decide to write a simple program that **stores and prints student's first and last name separately** as and when they register for the event.

Expected output:

Enter your first name: // Student enters the first name // Sindhu

Enter your last name: // Student enters the last name // Pai

First Name: Sindhu

Last Name: Pai

2. Sara is a content editor at a publishing house. One day, she receives an email where the entire text is written in uppercase letters. Her boss asks her to **convert all uppercase letters to lowercase** so that the text looks natural. Since manually fixing all the text would take too long, Sara decides to write a small program to automate the task. If any punctuation and numerals are included, keep it as it is.

Expected output:

Enter the text: Good 123 Morning!, and 23

Converted text: good 123 morning!, and 23

3. Emma found an old library catalog where book IDs were stored as strings instead of numbers. To sort and organize the books properly, she needs to convert these string-based IDs(only digits) into actual integers. **Without any built-in functions, can you help Emma transform the book ID into a numerical value?**

Hint: '1' - '0' = 1, '2' - '0' = 2

Expected output:

Input: 676

Output: String ID: 676

Numerical ID: 676

4. Emma is a spy who receives a secret message in the form of a string. Before decoding it, she needs to find **the length of the message to verify its integrity**. Since she cannot use built-in functions, she decides to write a **simple program to count the characters manually**.

Sample Execution outputs:

Input: Mission Success

Expected output: 15

5. An ATM machine requires a 4-digit PIN to proceed. However, some users accidentally enter letters or symbols instead of numbers. Your job is **to verify whether the input contains exactly 4 digits before allowing access. If the PIN is invalid, the system should display an appropriate message.**

Sample output is as below:

Enter your ATM PIN: 5678

Valid PIN!

Enter your ATM PIN: 12345

Invalid PIN! PIN must contain exactly 4 digits.

Enter your ATM PIN: 1sd3

Invalid PIN! PIN must contain exactly 4 digits.

6. Sophia is working as a security analyst. She receives two security codes and needs to verify if they are exactly the same. Since she cannot use built-in functions, she decides to **write a program that manually compares both strings character by character.**

Sample output - 1:

Enter str1 : sindhupai

Enter str2: sindhuRpai

Strings are different.

Sample output - 2:

Enter str1 : sindhu

Enter str2: sindhu

Both strings are the same.

7. At a campus marketing event, students believe that the first vowel in a customer's name might reveal fun insights. They need a **simple program to quickly extract the first vowel from a name.** If no vowel exists, the program should say so.

Sample outputs:

Enter the name : sindhu

First vowel: i

Enter the name : Thaksh

First vowel: a

Enter the name : THAKSH

First vowel: A

Enter the name : BCD

No vowel found.

8. A smart voice assistant is being developed for a new smart phone. When a user speaks a command, the assistant must count the number of words before analyzing the command. For example, a short command like **"Set alarm" contains 2 words**, while a longer command like **"Remind me to call mom at 5 PM" contains 7 words**. The assistant must **accurately count the number of words** before processing the request.
9. A team of students is working on a project and has two separate title parts: one for the subject and one for the subtitle. They want to combine these into one complete project title. Help them **create a program that concatenates the two parts with a space in between.**

Samples are as below:

Enter the first part: Data Structures

Enter the second part: using C

Expected output:

Project Title: Data Structures using C

10. Riya, a computer science student, was excited to build her own website where users could sign up and receive newsletters. However, she quickly realized a big problem—some users were entering invalid email addresses without an @ symbol or a missing dot (.) in the domain name. If she cannot fix this, people might never receive important updates. So, she decided to write a **simple C program to check whether an email ID was valid** before accepting it. Can you help Riya make her website smarter?

Valid email addresses are -> 123456.789@pes.edu, 123456789@pes.edu, sindhupai@pes.edu, 123456789@pes.

Invalid email addresses are-> 123456.789@pesedu, 123456789@pesedu, 123456789@pes, sindhur123pai@.

Level-2: Orange

11. A traffic police system needs to verify whether a vehicle's license plate follows the correct format. A valid plate should contain both letters and numbers. You are asked to write a program that **counts the number of letters and numbers separately**.

Expected results:

Enter license plate: KA05.ef6312

Letters: 4, Digits: 6

Enter license plate: 6312-KA-15

Letters: 2, Digits: 6

12. David loves secret codes and puzzles. He recently learned about palindromes—words that read the same forward and backward (like "madam" or "racecar"). He wants to **write a program to check if a given word is a palindrome**. Can you help David by writing a palindrome checker?

Sample results:

Enter a word: racecar

It is a palindrome.

Enter a word: RacEcar

It is not a palindrome.

13. Lisa found a mysterious book with some words written in mirror writing. To read the words correctly, Lisa needs to **flip the order of characters in every word without changing their position in the sentence**. Implement the program to help Lisa in this task.

Sample results are as below:

Enter the sentence: we are from pes

Expected output: ew era morf sep

14. Imagine you are working as a cyber security intern at a company. Your task is to create a **simple encryption system where every letter in a secret word is replaced by the next letter in the alphabet** ($A \rightarrow B$, $B \rightarrow C$, $Z \rightarrow A$).

Samples are as below:

pes -> qft

PEs -> QFt

Zqp -> Arq

15. Dr. Lisa, a genetic scientist, is working on an advanced DNA storage system. She needs to **convert binary data into a DNA sequence using the A, T, C, and G bases** for efficient data storage in biological material. However, she must do this manually **without built-in functions**. She writes a program to encode the binary string into a DNA sequence.

00 \rightarrow A

01 \rightarrow T

10 \rightarrow C

11 \rightarrow G

Expected results:

00011 -> AT

101011 -> CCG

111111 -> GGG

Level-3: Jackfruit

16. In the computer science lab, a group of students are learning C programming language. During a brainstorming session, they decide to create a "Happy Note Detector." They call a note as "happy" if it contains a contiguous sequence of more than two vowels (a, e, i, o, u) in a row. Students believe that such kind of happy notes bring good luck and creativity. **Help the students by writing a program that reads a note (a string) and checks whether it contains a contiguous substring of vowels longer than two characters. If it does, print "HAPPY"; otherwise, print "SAD".**

Sample outputs are as below.

Enter the string: sindhuisfromPES,CSE

SAD

Enter the string: sindhuisfrooamPES

HAPPY

17. During the annual cultural festival, a group of friends decided to spice up the event with a fun word puzzle contest. The challenge was simple: check if two words, secretly chosen by different teams, were anagrams of each other. An anagram means that by rearranging the letters of one word, you can form the other word. For example, one team claimed that "listen" and "silent" are connected by magic. Eager to prove their puzzle-solving skills, the friends wrote a **small C program to count the occurrences of each letter in both words and compare them**. If every letter appears the same number of times in both words, the program would reveal "YES", confirming the anagram; otherwise, it would print "NO". This challenge not only tested their programming skills but also their teamwork and creativity during the festival.

Sample results:

Enter the first string: silent

Enter the second string: listen

YES

Enter the first string: listen

Enter the second string: SIlent

NO

Enter the first string: programming

Enter the second string: margorpign

NO

Description: In third case, "programming" and "margorpign" are not anagrams since "programming" has two 'm's while "margorpign" has only one.

18. You have just started working as a cashier at a busy supermarket. It's a rush hour, and customers are lining up at the counter, waiting to get their items scanned. Everything is going smoothly until— ERROR occurs "The barcode scanner rejects a product code". You check the receipt and realize that some product codes are entered incorrectly by new employees.

The store's system has a strict format for product codes:

A. The code must start with a capital letter (A-Z), representing the product category.

B. The rest of the product code should only contain digits (0-9), representing the item number.

If an incorrect code is entered, the entire billing system could crash, leading to frustrated customers and a loss for the supermarket. Your task is to build a system to verify whether a product code is valid or not before processing it!

Input : A1234 Expected output : Valid product code.

Input : 1234A Expected output : Invalid product code.

Input : a1234 Expected output : Invalid product code.

Input : S1234A Expected output : Invalid product code.

Input : D123412176 Expected output : Invalid product code.

19. Imagine you are a data analyst at a social media company like Twitter or Instagram. Your job is to identify trending topics by analyzing hash tags in user's posts. One day, your manager rushes into your office. "We need a report on the **most popular hash tags used today!** If we don't track trends, we'll fall behind our competitors! You quickly check the system and realize—there's a big problem!"

The company's software doesn't have an automatic way to extract hashtags (#) from posts. This means millions of posts have to be manually checked, which is impossible!

You need to **build a tool that can scan a tweet, detect all hashtags, and list them so the system can track them automatically.** If you don't act fast, your company might lose valuable trend insights and fall behind in the social media race!

Sample results:

Enter tweet: Love this weather! #sunny #happyday #blessed

Hashtags: #sunny #happyday #blessed

Enter tweet: #sunny #happyday #blessed Love this weather!

Hashtags: #sunny #happyday #blessed

Enter tweet: #sunny #happyday #blessedLove this weather!

Hashtags: #sunny #happyday #blessedLove

20. Thaksh lives in a mysterious room with a single magic bulb and N magical buttons. The bulb is initially on, glowing brightly. However, there's a catch—each button is connected to the bulb in a strange way. **If Thaksh presses any single button, the bulb changes its state: if it was on, it turns off, and if it was off, it turns on!**

One day, Thaksh accidentally pressed some buttons, but he doesn't remember which ones. He only has three inputs:

Count of magical buttons - N

The initial state of all the buttons in binary

The final state of the buttons in binary after he pressed some of them

Now, he needs to figure out whether the bulb is still ON(1) or OFF(0). Can you help Thaksh solve this puzzle by implementing this as a C Program?

Hint: If you press the switch once, the light changes once. If you press it twice, the light returns to its original state.

Sample result – 1:

Enter number of buttons: 5

Enter initial 01010

Enter final 10101

Initial and Final states are 01010 and 10101

output : 0

Sample result – 2:

Enter number of buttons: 3

Enter initial 000

Enter final 110

Initial and Final states are 000 and 110

output : 1

Sample result – 3:

Enter number of buttons: 2

Enter initial 00

Enter final 00

Initial and Final states are 00 and 00

output : 1

Happy Learning Strings by solving problems!!!