



Programming Fundamentals (Lab Manual)



Lab Manual **Computer Engineering for Session 2019 (Semester Fall-2019)** **Programing Fundamentals**

This course is a comprehensive introductory course that is intended for students who have no background in computer programming. The aim of this course is to provide students with a firm foundation of “Basics of Programing Fundamentals” and to make them able to design C++ code of algorithms. The aim is to provide foundation of programing and to polish the skills of understanding computational problems in algorithmic way. The programming language used in this programming course is C++.

Lab Manual

Instructor: Ms. Sahar Waqar

Graduate Assistant: Usman Ghani, Muhammad Nazam Maqbool



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Computer Engineering for Session 2019 (Semester Fall-2019) Programming Fundamentals (Lab 4)

Target: Control structure(IF, IF-ELSE, SWITCH Case), Conditional Operators, Relational and Logical Operator.

i) **Guidelines/Instructions:**

- Plagiarism/Cheating is highly discouraged by assigning 0 to both who tried and one who shared his/her code.
- Lab work must be evaluated during lab timing and homework is for submission.
- Contact your teacher and GAs during their office hours (mentioned at end of lab.)

ii) **Reading/ Helpful Material:**

- **Consult Chapter No 4 of book “C++: Programming from Problem Analysis to Program Design by D.S Malik (latest edition)” for better understanding of given problems.**
- C++ If, If-Else, If-Else-If, Switch Statements with examples and flowcharts:
(<https://codescracker.com/cpp/cpp-selection-statements.htm>)
(<https://www.geeksforgeeks.org/decision-making-c-c-else-nested-else/>)

iii) **Tasks to be completed in lab:**

Example program 1:

C++ program to demonstrate working of Relational Operators and IF_ELSE

```
#include <iostream>
using namespace std;
int main()
{
    int a=10, b=4;
    // relational operators greater than example
    if (a > b)
        cout << "a is greater than b\n";
    else
        cout << "a is less than or equal to b\n";
    // greater than equal to
    if (a >= b)
        cout << "a is greater than or equal to b\n";
    else
        cout << "a is lesser than b\n";
    // less than example
    if (a < b)
        cout << "a is less than b\n";
    else
        cout << "a is greater than or equal to b\n";
    // lesser than equal to
    if (a <= b)
        cout << "a is lesser than or equal to b\n";
    else
        cout << "a is greater than b\n";
}
```

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```
// equal to
if (a == b)
    cout << "a is equal to b\n";
else
    cout << "a and b are not equal\n";
// not equal to
if (a != b)
    cout << "a is not equal to b\n";
else
    cout << "a is equal b\n";
return 0;
}
```

Example Program 2:

C++ program to demonstrate working of logical operators and IF-ELSE Structure.

```
#include <iostream>
using namespace std;
int main()
{
    int a=10, b=4, c = 10, d = 20;
    // logical operators logical AND example
    if (a>b && c==d)
        cout << "a is greater than b AND c is equal to d\n";
    else
        cout << "AND condition not satisfied\n";
    // logical AND example
    if (a>b || c==d)
        cout << "a is greater than b OR c is equal to d\n";
    else
        cout << "Neither a is greater than b nor c is equal to d\n";
    // logical NOT example
    if (!a)
        cout << "a is zero\n";
    else
        cout << "a is not zero";

    return 0;
}
```

1. Write a program that inputs marks and displays “Congratulations! You have passed.” If the marks are 40 or more.
2. Write a program that inputs marks of three subjects. If the average of marks is more than 80, it displays two messages “you are above standard!” and “Admission granted!”.
3. Write a program that inputs five integers. It finds and prints the largest and smallest integer. .
4. Write a program that inputs a number and finds whether it is even or odd using if-else structure.

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- Write a program that inputs basic salary and job grade and calculates total salary according to grade. Add 50% of the salary as bonus if the grade is greater than 15 and 25% bonus if the grade is 15 or less and then displays the total salary.
- Write a program that inputs salary. If the salary is 20000 or more, it deducts 7% of salary. If the salary is 10000 or more but less than 20000, it deducts 1000 from salary. If salary is less than 10000, it deducts nothing. It finally displays the net salary.
- Write a program that inputs three numbers and displays the smallest number by using nested if conditions.
- Write a program that allows the user to enter any character through the keyboard and determines whether it is a capital letter, small case letter, a digit number or a special symbol.
- Write a program that inputs number of week's day and displays the name of the day. For example, if user enters 1, it displays "Friday" and so on using **switch/case** structure. If you have not studied **switch/case** structure so far, you can use if/else.
- Write a program that inputs a character from the user and checks whether it is a vowel or consonant using switch statement. If you have not studied **switch** statement so far, you can use if/else.
- Write a program that inputs a number and displays whether it is divisible by 3 or not by using conditional operators.

iv) Tasks to be submitted:

- Write a program that inputs three digits and displays all possible combinations of these digits.
- Senior salesperson is paid Rs. 400 a week, and a junior salesperson is paid Rs. 275 a week. Write a program that accepts as input a salesperson's status in the character variable status. If status is 's' or 'S' the senior person's salary should be displayed; if status is 'j' or 'J', the junior person's salary should be displayed, otherwise display error message.
- In a right triangle, the square of the length of one side is equal to the sum of the squares of the lengths of the other two sides. Write a program that prompts the user to enter the lengths of three sides of a triangle and then outputs a message indicating whether the triangle is a right triangle.
- Write a program that mimics a calculator. The program should take as input two integers and the operation to be performed. It should then output the numbers, the operator, and the result. You must provide support for at least 15 operators (+, -, /, *, &&, ||, &, |, % etc.) For division, if the denominator is zero, output an appropriate message. Some sample output: Input will be 3, 4 and operator = 1 (+), output will 3 + 4 = 7.
 - Write this program using if/else
 - Write this program using switch/case
- Write a program to find Roots of Quadratic Equations. For a quadratic equation $ax^2+bx+c = 0$ (where a, b and c are coefficients), it's roots is given by following the formula.

$$x = \frac{-b \pm \sqrt{b^2 - 4ac}}{2a}$$

The term b^2-4ac is known as the discriminant of a quadratic equation. The discriminant tells the nature of the roots.

- If discriminant is greater than 0, the roots are real and different.
- If discriminant is equal to 0, the roots are real and equal.
- If discriminant is less than 0, the roots are complex and different.

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6. Air quality index is the measurement of the quality of air we are breathing in. If it is more than a certain limit, it becomes hazardous for health. AQI for Lahore in certain locations is in critical zone. Write a C++ program which takes location name as input and tells the user about the AQI of that location. You must also inform him about the quality of the air i.e. good, bad, hazardous etc. You must look on internet about the AQIs for different locations. You will be using following locations for finding AQIs i.e. Model town, Johar town, Iqbal town, Shahdara, UET, GT Road, Samanabad, Defence Phase I, Askari X, Bahria Town and Shalamar.
7. Write a program which asks the user about his/her registration number and tells him about its validity. There are three possible formats for registration number: 2019-CS-1, 2017R/2018-CS-1 and 2019-CD-CS-1. Roll number can be a number between 1 to 260 and year can be anything between 2015 to 2019. If user enters any registration number other than this format, then a proper error message should be shown to the user. If registration number is according to the format, you should also convey the user that this is a valid registration number. For example: if user types 2019CS53, your program should generate a proper error message, explaining that he did not write in proper format.

v) Submission instructions:

- Only .cpp files should be submitted.
- Do not submit .exe files.
- Name your files according to the question i.e. q1.cpp, q2.cpp and q3.cpp etc.
- Zip all the files and submit the .zip file on Eduko.

Office hours and email address for communication:

- Ms. Sahar Waqar (Teacher)
 - ✚ Email: sahar.waqar@uet.edu.pk
 - ✚ Office hours:
 - Tuesday (**Fixed**): 11:00 pm to 12:45 pm
 - Wednesday (Variable): 11:00 am to 1:00 pm (May change due to meetings)
 - Wednesday (**Fixed**): 1:00 pm to 3:00 pm
- Mr. Usman Ghani (Graduate assistant)
 - ✚ Email:
 - ✚ Office hours:
- Mr. Muhammad Nazam Maqbool (Graduate assistant)
 - ✚ Email: ashirmaqbool1611@gmail.com
 - ✚ Office hours:

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