Lab Assignment 9

Course: CS202 Software Tools and Techniques for CSE
Lab Topic: Development of C# Console Applications
Date: 13th October 2025

Objective
This lab introduces students to .NET development using C# in Visual Studio. The focus is on creating simple console applications to understand basic syntax, control structures, and object-oriented programming principles in C#.

Learning Outcomes
By the end of this lab, students will be able to:

- ✓ Set up and use Visual Studio for .NET development.
- ✓ Write and execute basic C# console applications.
- ✓ Implement fundamental programming constructs: loops, conditionals, and functions.
- ✓ Apply object-oriented programming concepts in C#.

Lab Requirements

- ➢ Operating System: **Windows**
- ➢ Software: Visual Studio 2022 (Community Edition), Visual Studio with .NET SDK
- ➢ Programming Language: C# (latest stable version)

Lab Activities:

- ❖ **Setting Up .NET Development Environment.**
  - ➢ Open Visual Studio and create a new `C# Console Application` project.
  - ➢ Ensure the target framework is .NET 6 or later.
  - ➢ Write a simple program (any) and run it.
- ❖ **Understanding Basic Syntax and Control Structures**
  - ➢ Write an object-oriented C# program that:
    - Accepts user input[1] for two numbers.
    - Performs addition, subtraction, multiplication, and division.
    - Uses `if-else` conditions to determine if the sum is even or odd.
    - Displays the results using `Console.WriteLine()`.
- ❖ **Using Loops and Functions**
  - ➢ Design an object-oriented C# program that:
    - Uses a `for` loop to print numbers from 1 to 10.
    - Uses a `foreach` loop to print numbers from 1 to 10.
    - Uses a `do-while` loop to keep asking the user for input until they enter `exit`.
    - Defines and calls a function[2] that calculates the factorial of a number provided by the user.

---

[1] Use Visual Studio IDE suggestions to identify the method that should be called to achieve this.
[2] You should make this function `static` if your logic if outside the `Main()` method AND you do not plan to create any objects on which to call this function.

Note: Please reach out to the TAs for any queries/issues.

❖ **Using Single and Multi-dimensional Arrays**

➢ Design an object-oriented C# program that:

- Implements the bubble sort algorithm on array[3] of integers. You should not use any library functions to achieve this task. The entire logic must be present in your C# code.
- Stores a 2-D array into one 1-D array in: (i) row major order, (ii) column major order.
- Performs matrix multiplication of two matrices A and B and stores the resultant in matrix C and print it.

❖ **Output Reasoning (Level 0)**

➢ **What will be the output of the following C# code? Why?**

```
using System; //namespace
class Program //default visibility[4] is 'internal' if not specified
{
    public static void Main(string[] args)
    {
        int a = 0; //default visibility is 'private' (in a class)
        Console.WriteLine(a++);
    }
}
```

➢ **What will be the output of the following C# code? Why?**

```
using System;
class Program
{
    public void Main(string[] args)
    {
        int a = 0;
        Console.WriteLine(a++);
    }
}
```

❖ **Output Reasoning (Level 1)**

➢ **What will be the output of the following C# code? Why?**

```
class Program
{
    public static void Main(string[] args)
    {
        int a = 0;
        int b = a++;
        Console.WriteLine(a++.ToString(),++a,-a++);
        Console.WriteLine((a++).ToString() + (-a++).ToString());
        Console.WriteLine(~b);
    }
}
```

[3] https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/builtin-types/arrays

[4] https://learn.microsoft.com/en-us/dotnet/csharp/programming-guide/classes-and-structs/access-modifiers

Note: Please reach out to the TAs for any queries/issues.

- **What will be the output of the following C# code[5]? Why?**

```
using System;
/*you can also write top level code outside of a class. C# takes
care of this by providing internal entry point Main*/

Console.WriteLine("int x = 3;");
Console.WriteLine("int y = 2 + ++x;");

int x = 3; //default visibility is 'internal' (outside a class)
int y = 2 + ++x;
Console.WriteLine($"x = {x} and y = {y}");

Console.WriteLine("x = 3 << 2;");
Console.WriteLine("y = 10 >> 1;");

x = 3 << 2;
y = 10 >> 1;
Console.WriteLine($"x = {x} and y = {y}");

x = ~x;
y = ~y;
Console.WriteLine($"x = {x} and y = {y}");
```

Output Reasoning (Level 2)

- **What will be the output of the following C# code[6]? Why?**

```
using System;
public class Program
{
    static void Main()
    {
        try
        {
            int i=int.MaxValue;
            Console.WriteLine(-(i+1)-i);
            for(i=0; i<=int.MaxValue;i++); //note semicolon here
            Console.WriteLine("Program ended!");
        }
        catch(Exception ex)
        {
            Console.WriteLine(ex.ToString());
        }
    }
}
```

- **What will be the output of the following C# code[7]? Why?**

```
using System;
public class Program
{
    static void Main(string[] args)
    {
```

[5] https://learn.microsoft.com/en-us/dotnet/csharp/fundamentals/program-structure/top-level-statements
[6] https://learn.microsoft.com/en-us/dotnet/csharp/fundamentals/exceptions/exception-handling
[7] https://learn.microsoft.com/en-us/dotnet/csharp/language-reference/operators/collection-expressions

Note: Please reach out to the TAs for any queries/issues.

```
        Main(["CS202"]);
    }
}
```

Resources

- Lecture 9 Slides
- https://learn.microsoft.com/en-us/dotnet/csharp

Note: Please reach out to the TAs for any queries/issues.