**Course Title: Visual Programming with C#**

Course No.: ICT. Ed. 465 | Nature of course: Theoretical + Practical

Level: Bachelor | Credit Hour: 3 hours (2T+1P)

Semester: Sixth | Teaching Hour: 80 hours (32+48)

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## 1. Course Description

This course aims to equip students with a foundational understanding of object-oriented programming concepts and the ability to proficiently create contemporary software applications utilizing the .NET framework and C#. Its primary objective is to furnish application developers with a comprehensive grasp of Microsoft® .NET through C#, offering essential skills for building robust C# applications integrated with databases.

## 2. General Objectives

The general objectives of this course are as follows:

- To explain the .NET Framework ecosystem for the development of Graphical User Interface (GUI) applications
- to develop a strong understanding of the fundamental ideas in object-oriented programming and the structure and syntax of the C# language.
- to create and build user-friendly applications with interactive interfaces, and developed full functional web solutions using object-oriented principles.

## 3. Specific Objectives and Contents

| Specific Objectives | Contents | Lecture Hours (Th + Pr) |
|---|---|---|
| • Outline the features and architecture of the .NET framework<br>• Provide an overview of the C# IDE<br>• Illustrate the working environment within Visual Studio | **Unit I: Introduction to .NET**<br>1.1. .NET framework: Features and Architecture<br>1.2. .NET Components: Common Language Runtime, Class Library<br>1.3. .NET Framework, .NET Core, and .NET Standard<br>1.4. Introduction of Visual Studio and Visual Studio Code IDE, Setting up Visual Studio Development Environment, IntelliSense<br>1.5. Project Types in .NET | **2+2** |
| • Describe the basic features, uses and structure of C# language.<br>• Design the Control structure using looping expressions and array in C# language.<br>• Explain and implementation of OOP concept with its key features<br>• Explain the use of constructor, interfaces and abstract classes<br>• Design and deploy exception handling techniques | **Unit II: Basics of C#**<br>2.1. Introduction<br>2.2. Data Types, Operators, Variables<br>2.3. Control Statements<br>2.4. Arrays, Classes, Structures, Enumerations<br>2.5. Partial Classes, Static classes, Sealed Classes<br>2.6. Constructors and Destructor<br>2.7. Concept and implementations of Inheritance and Polymorphism<br>2.8. Concept and implementation of Interfaces<br>2.9. Virtual Methods, Abstract classes and Methods<br>2.10. Exception Handling | **9+10** |

| | | |
|---|---|---|
| • Describe the delegate, lambda expression, and events<br>• Explain and define string operation and implement string expression<br>• Explain and implementation of collections in C# | **Unit III: Delegates and String**<br>3.1. Delegates<br>3.2. Lambda Expression and its implementation<br>3.3. Event Handling<br>3.4. String Manipulation and String Builder<br>3.5. Collections: Generic and Non-generic | **4+6** |
| • Explain and implementation of Entity Framework with various Database approaches<br>• Explain and implementation of the LINQ | **Unit IV: Entity Framework and LINQ**<br>4.1. Introduction to Entity Framework<br>4.2. Understanding and Implementing Database First, Code First, Model First<br>4.3. LINQ and its implementation of LINQ | **4+6** |
| • Explain the use of ASP.NET frameworks for different applications<br>• Database Interaction and routing in ASP.NET MVC<br>• Explain the C# Razor in ASP .net pages | **Unit V: ASP.NET**<br>5.1. ASP.NET vs ASP.NET Core<br>5.2. ASP.NET Frameworks for Web Applications: Web Forms, ASP.NET MVC, and ASP.NET Web Pages<br>5.3. Creating a simple Web Forms application<br>5.4. Understanding ASP.NET MVC architecture<br>5.5. Creating models, views, controllers and URL routing in ASP.NET MVC<br>5.6. Creating a basic layout for ASP.NET Web Pages<br>5.7. Razor syntax for embedding code in HTML, Working with variables, loops and logical expressions<br>5.8. Database interaction with ASP.NET MVC | **7+12** |
| • Identify the basics of database connection with its architecture<br>• Design the application with the database.<br>• Execute the connection and execute the basic commands to a database<br>• Implement the database in Entity Framework | **Unit VI: Database Programming**<br>6.1. Introduction to ADO.NET, ADO.NET architecture<br>6.2. DataReader, Dataset, DataTable and DataAdapter<br>6.3. Database Connection and working with Database Specific Classes (SqlConnection, SqlCommand, SqlTransaction)<br>6.4. Accessing data with ADO.NET, implementing CRUD operations, Executing Commands (ExecuteNonQuery(), ExecuteReader(), ExecuteScalar())<br>6.5. Stored Procedure and working with Stored Procedures<br>6.6. Database and Entity Framework | **6+12** |

## 4. Instructional Techniques

The instructional techniques for this course are divided into two groups. The first group consists of general instructional techniques applicable to most of the units. The second group consists of specific instructional techniques applicable to particular units.

### 4.1. General Technique

Students will receive reading materials for each unit, and all units incorporate lectures, discussions, the use of a multimedia projector, and brainstorming sessions.

### 4.2. Specific Instructional Technique

The demonstration is an essential instructional technique for all units in this course during teaching-learning process. Specifically, demonstration with practical works will be the specific instructional technique in this course. The details of suggested instructional techniques are presented below:

### 4.3. Laboratory Work

A minimum of 20 exercises has been established by the faculty. These exercises will cover a wide range of real-life and scientific problems, ranging from the creation of small programs to the development of moderately complex subroutines, as well as the design of programs for practical applications and problem-solving scenarios. To assess students, laboratory assignments will be conducted in groups of two to four. Overall, the Laboratory Work should encompass assignments and exercises from the specified areas below:

1. Control Flow
2. Class and object
3. Static and Dynamic binding
4. Constructor and destructors
5. OOPs and implementation of key features
6. Delegates, Events and Lambda
7. Collections
8. Entity framework and LINQ
9. ASP.NET Frameworks for GUI applications
10. ADO.net and Entity framework.

### 4.4. Project Work

Develop and deploy a real-life application using the concepts covered in visual programming course. Project Presentation and Project report should be prepared and submitted to the External Examiner appointed by dean office for practical work evaluation.

## 5. Evaluation

| Internal Assessment | Semester Examination | External Practical Exam/ VIVA | Total Marks |
|---|---|---|---|
| 40 Marks | 40 Marks | 20 Marks | 100 Marks |

***Note:*** *Students must pass separately in internal assessment, external practical exam and semester examination.*

### 5.1. Internal Evaluation (40 marks)

Internal evaluation will be conducted by subject teacher based on following criteria:

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|---|---|
| 1) Class Attendance | 5 marks |
| 2) Learning activities and class performance | 5 marks |
| 3) First assignment (Written Assignment) | 10 marks |
| 4) Second assignment (Case Study/ Project Work with Presentation) | 10 marks |
| 5) Terminal Examination | 10 marks |
| **Total** | **40 Marks** |

### 5.2. Semester Examination (40 marks)

Examination Division, Dean office will conduct final examination at the end of semester:

| | |
|---|---|
| 1) Objective questions (Multiple choice 10 questions x 1 mark) | 10 marks |
| 2) Subjective answer questions (6 questions x 5 marks) | 30 marks |
| **Total** | **40 Marks** |

### 5.3. External Practical Examination/ VIVA (20 marks)

Examination Division, Dean Office will conduct final practical examination at the end of semester.

## 6. Recommended books and References materials (including relevant published articles in national and international journals)

### 6.1. Recommended Books and References


- Adam Freeman, A. (2023). *Pro ASP.NET Core 7*, 10th Edition. Manning Publication
- Stellman, A., & Greene, J. (2021). *Head First C#: A Learner's Guide to Real-World Programming with C# and .NET Core, 4th Edition,* O' Really Media
- Albahari, J. (2022). *C# 10 in a Nutshell, 1st Edition.* O'Reilly.
- Smith, J.P. (2021). *Entity Framework Core in Action, 2nd Edition.* Manning Publication
- Michael B. White, M.B. (2019). *Mastering C#: A Step by Step Guide for the Beginner, Intermediate and Advanced User, Including Projects and Exercises.* Independently Published
- Schildt, H. (2010). *C# 4.0: The Complete Reference, 1st Edition.* McGraw-Hill
- Patrick, T. (2010). *Microsoft ADO.NET 4 Step by Step, 1st Edition,* O' Really Media
- Mueller, J.P. (2013). *Microsoft ADO.NET Entity Framework Step by Step.* Microsoft Press