Building Cross-Platform MAUI Apps with Bluetooth, GPS, and Device Sensors

Course Duration: 40 Hours **Course code: MAUI-BT-GPS-DS01**

1. Course Overview

This five-day course focuses on building cross-platform mobile and desktop applications using .NET MAUI. You will learn how to integrate device capabilities such as Bluetooth communication, GPS location services, and hardware sensors (accelerometer, gyroscope, etc.). The course emphasizes real-world application development, enabling you to create responsive, device-aware applications across Android, iOS, Windows, and macOS.

2. What you'll learn?

By the end of the course, you will be able to:

- Understand the architecture and features of .NET MAUI
- Develop cross-platform applications using a single codebase
- Implement Bluetooth communication between devices
- Access and utilize GPS/location services in MAUI apps
- Work with device sensors like accelerometer, gyroscope, and compass
- Handle permissions and platform-specific configurations
- Build responsive UI using XAML and C#
- Integrate native APIs and third-party plugins
- Debug, test, and deploy MAUI applications across platforms

3. Target Audience

- Mobile app developers
- .NET developers transitioning to cross-platform development
- Software engineers and application developers
- IoT and embedded system developers

- Students and professionals interested in device-integrated apps

4. Pre-Requisites

Before taking this course, you should have:

- Basic knowledge of C# and .NET
- Understanding of object-oriented programming concepts
- Familiarity with Visual Studio IDE
- Basic understanding of mobile app development (preferred but not mandatory)

5. Course content

Module 1: Course Introduction

- Introduction and course logistics
- Overview of cross-platform development
- Course objectives and outcomes

Module 2: Introduction to .NET MAUI

- What is .NET MAUI?
- MAUI architecture and project structure
- Understanding single project approach
- Setting up development environment

Module 3: Building User Interfaces in MAUI

- Introduction to XAML
- Layouts and controls in MAUI
- Styling and theming
- Data binding and MVVM basics

Module 4: Navigation and Application Lifecycle

- Page navigation (Shell, NavigationPage)
- Passing data between pages

- App lifecycle management
- State management

Module 5: Working with Device Permissions

- Understanding runtime permissions
- Handling platform-specific permissions
- Best practices for user privacy and security

Module 6: Integrating GPS and Location Services

- Accessing device location
- Using geolocation APIs
- Handling real-time location tracking
- Displaying location on maps

Module 7: Working with Bluetooth Connectivity

- Introduction to Bluetooth and BLE
- Discovering and connecting to devices
- Sending and receiving data
- Handling connection lifecycle and errors

Module 8: Using Device Sensors

- Overview of device sensors
- Accelerometer and gyroscope usage
- Compass and orientation detection
- Real-world use cases of sensors

Module 9: Working with Platform-Specific Code

- Accessing native APIs
- Dependency services and handlers
- Writing platform-specific implementations

Module 10: Data Storage and Connectivity

- Local storage (Preferences, SQLite)
- Working with files
- Consuming REST APIs
- Handling offline scenarios

Module 11: Debugging and Testing MAUI Applications

- Debugging tools and techniques
- Emulator vs real device testing
- Performance optimization
- Error handling strategies

Module 12: UI Enhancements and Responsive Design

- Adaptive layouts
- Handling multiple screen sizes
- Animations and visual effects

Module 13: Deployment and Publishing

- Building apps for Android, iOS, Windows
- App packaging and signing
- Publishing to app stores

Module 14: Security and Best Practices

- Secure data handling
- API security practices
- Code optimization techniques

Module 15: Capstone Project

- Build a real-world MAUI app integrating:

- Bluetooth communication
- GPS tracking
- Device sensors
- Testing and deployment of final project

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