Teaching Guidelines for

MS.Net Technologies

PG-DAC March 2023

Duration: 84 hours (42 theory hours + 34 lab hours + 8 revision/practice hours)

Objective: To acquire the knowledge of Microsoft.NET 6.

Prerequisites: Students are expected to know any OOP. They should have undergone the Web Programming module which includes HTML, CSS, JavaScript, JSON, and XML. Knowledge of any database is required.
Note: Training will be carried out on .Net 6 using Visual Studio 2022

Evaluation: 100 marks
Weightage: Theory exam – 40%, Lab exam – 40%, Internals – 20%

Text Book:

- Pro C# 10 with .Net 6 - Foundational Principles and Practices in Programming by Andrew Troelsen & Philip Japikse / Apress

References:

- C# 10 and .Net 6 - Modern Cross-Platform Development by Mark J. Price / Packt

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(Note: Each Session is of 2 hours)

Session 1:
Lecture:
Introduction to the .Net Framework
Intermediate Language (IL)
Assemblies and their structure, EXEs/DLLs
CLR and its functions

- JIT Compilation
- Memory Management
- Garbage Collection
- AppDomain Management
- Memory Management
- CLS, CTS
- Security

NO LAB

Session 2:
Lecture:
.Net Framework, .Net Core, Mono, Xamarin differences
Versions of the Framework
Managed and Unmanaged Code
Introduction to Visual Studio
Using ILDASM
NO LAB

Session 3:
Lecture:
Console Applications and Class Libraries .Net Core
C# Basics
Project References, using
Classes
Data Types in .net and CTS equivalents
Methods

- Method Overloading
- Optional Parameters
- Named Parameters and Positional Parameters
- Using params
- Local functions

Properties

- get, set
- Readonly properties
- Using property accessors to create Readonly property

Constructors
Object Initializer
Destructors
Discussion on IDispose. To be implemented after interfaces
Lab:
Create a class that has Properties, Fields, Methods, Constructors (Trainer can specify any class of his choice, e.g. Student, Employee, etc)

Session 4:
Lecture:
Static Members of a Class

- Fields
- Methods
- Properties
- Constructors

Static Classes
Static local functions
Inheritance

- Access Specifiers
- Constructors in a hierarchy
- Overloading in derived class
- Hiding, using new
- override
- sealed methods
- Abstract Classes
- Abstract Methods
- Sealed Classes

Lab:
Create multiple classes that use Inheritance based concepts

Session 5:
Lecture:
Interfaces

- Implementing an interface
- Explicitly implementing an interface
- Inheritance in interfaces
- Default interface methods

Operator overloading

Lab:

Create and implement interfaces for the classes created in Lab 4

Implement IDisposable, IComparable

Session 6:

Lecture:

Reference and Value Types

Value Types

- struct
- enum

out and ref

nullable types

nullable reference types

?? and ??=

Working with Arrays (single, multidim, jagged), Array Class members

Indices and ranges

Indexers

Lab:

Lab based on array examples.

Also create an array of the class created in Lab 1.

Session 7:

Lecture:

Generic classes

Generic methods

Generic Constraints

Collections – generic and non-generic

Collection Examples based on ICollection, IList, IDictionary (both generic and non-generic)

Iterating collections using foreach

Using Tuples to pass multiple values to a function

Lab:

Lab based on collection examples.

Also create a collection of the class created in Lab 1.

Session 8:

Lecture:

Delegates

- Calling methods using delegates
- Uses of delegates
- Multicast delegates
- Action, Func, Predicate delegates

Anonymous methods

Lambdas

Lab:

Lab based on delegates examples.

Session 9:
Lecture:
Error Handling (Exceptions Handling)

- Checked & Unchecked Statements
- The try, catch, finally
- Dos & Don'ts of Exception Handling

User Defined Exception classes
Declaring and raising events
Handling events
Lab:
Lab based on exceptions and events examples.

Session 10:
Lecture:
Anonymous types
Extension methods
Partial classes
Partial methods
LINQ to objects
Writing LINQ queries
Deferred execution
LINQ methods
PLINQ
Lab:
Lab based on LINQ examples
Students to try tutorial for 101 LINQ Queries

Session 11:
Lecture:
Creating a shared assembly
Creating Custom Attributes
Using Reflection to explore an Assembly
Using Reflection to load an Assembly dynamically
Files I/O and Streams

- Working with drivers, Directories, and Files
- Reading and Writing files

NO LAB

Session 12:
Lecture:
Threading

- ThreadStart, Parameterized ThreadStart
- ThreadPool
- Synchronizing critical data using lock, Monitor and Interlocked

Working with Tasks

- Calling functions with and without return values
- Using async, await

Using the Task Parallel Library
Lab:
Threading related examples
Task related examples

Sessions 13-19:
Lecture:
Introduction to Asp.Net MVC CORE

- Architecture of an ASP .Net MVC application
- Understanding Folder structures and configuration files

Understanding Controllers and Action

- Create a controller
- How actions are invoked
- HttpGet , HttpPost , NoAction Attributes
- Running Action result.

Understanding Views & Models

- Creating Models & ViewModel
- Creating Razor Views
- HTML Helper Functions
- Understanding ViewBag
- Create a view using ViewBag
- Validation using Data Annotations
- Client side and server side validation
- Self validated model
- Creating Strongly Types Views
- Using Various Scaffold Templates
- CRUD operation using Model

MVC State Management

- ViewBag , TempData , Session , Application
- Cookies , QueryString

MVC Module

- Partial View
- Action Method and child action

Data Management with ADO.NET

- Microsoft.Data.SqlClient introduction
- Connection object, Command object, DataReader, DataAdapter, DataSet and DataTable.
- Asynchronous command Execution
- Asynchronous Connections

Understanding Routing & Request Life Cycle

- Routing Engine & Routing Table
- Understanding and configuring Routing Pattern in RouteConfig File
- Understanding 404 error and resource not found.
- Using Attributes Routing
- Understanding Request Life Cycle

Layouts , Bundle , Minification

- Creating Layout and using with associated views
- Understanding Bundling and Minification
- Using BundleConfig file
- Attaching css , js , bootstrap in bundles
- Custom Helper Function
- Asynchronous Actions
- Error Handling in MVC with Log Entry
- Filters and Custom Action Filter

MVC Security

- Using Authorize & Allow Anonymous attributes

- Implementing Forms Based Authentication
- Preventing Forgery Attack using AntiForgeryToken
- Preventing Cross Site Scripting Attack

Entity Framework

- Introduction to EF
- Different Approaches
- Using Code First Approach
- Using various Data Annotations
- Using Validation, Primary Key , Foreign Key etc
- Using Fluent APIs
- Database Migrations
- CRUD operation using EF

Developing MVC application using EF Code First Approach
Introduction to Razor Pages

Lab:
Lab exercise covering the concepts covered in the class

Session 20:
Lecture:
Localization in MVC (Demo Only)
Deploying ASP .NET MVC application (Demo only)
NO LAB

Session 21
Lecture:
Web APIs

- Creating ASP.NET MVC Web API
- Configuring for CORS
- Different Verbs
- Consuming using a client
- Using Newtonsoft APIs

Lab:
Create a RESTful service using WEB API. Create a consumer.