

Teaching Guidelines for
MS.Net Technologies
PG-DAC August 2024

Duration: 90 hours (50 theory hours + 40 lab 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 .Net6 using Visual Studio 2022

Evaluation: 100 marks

Weightage: CCEE– 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 IDisposable. 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, ParameterizedThreadStart
- 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

Sessions 21, 22 & 23

Lecture:

Web APIs

- Creating ASP.NET MVC Web API
- Configuring for CORS
- Different Verbs
- Consuming using a client
- Using Newtonsoft APIs
- Integrating Web API with React App
- Configuring CORS of React App and Web API
- Sending request from React App, processing at Web API and effecting the database

Lab (4 hours):

Create a RESTful service using Web API.

Create a consumer.

Sessions 24 & 25

Lecture:

MVC integration with React

- Introduction to MVC and React
- Setting up the Project
- Integrating React with MVC Backend
 - Define Models
 - Implement Controllers
 - Use Views
- Data Management and State Handling
 - Establish data flow
 - Manage state
- Advanced Topics and Best Practices
 - Authentication and Authorization
 - Routing
 - Structuring React components

Lab:

Create a RESTful service using WEB API with React as the front end.

Create a consumer.