Full Stack Development using MERN Stack

Duration: 100 hours
Objective: To acquire the knowledge of Full Stack Web Development using NodeJs, ReactJS and MySQL.
Prerequisites: Students are expected to know any OOP's Based Language. They should have undergone the Web Programming basics which includes HTML, CSS, JavaScript, Knowledge of any database is required.

Module 1: Introduction to Web

- Brief history of the Internet, How does the Internet work?
- Internet Protocol
- Domain Name Service servers
- HTTP Protocol
- Web Server vs Application Server
- Architecture of the Web

Module 2: HTML & HTML5

- Introduction to HTML
- Basic HTML Tags
- HTML Form & Controls
- HTML5: New features in HTML5

Module 3: Cascading Style Sheets (CSS)

- Introduction to CSS, Styling HTML with CSS, Structuring pages with CSS,
- Inline CSS, Internal CSS, External CSS
- CSS Selectors
  - Linking a style to an HTML document
- Responsive Web Design with Bootstrap

Module 4: JavaScript

- Introduction to JavaScript, Variables in JavaScript
- Statements, Operators, Comments, Expressions, and Control Structures
- JavaScript Scopes
- Strings, Numbers, Date
- Arrays, Array Methods

Module 5: JavaScript

- Objects, Object Definitions, Object Properties, Object Methods, Object Prototypes
- Functions, Function Definitions, Function Parameters, Function Invocation, Function Closures

Module 6: JavaScript

- Document Object Model (DOM)
  - o Object hierarchy in JavaScript
  - o HTML DOM, DOM Elements, DOM Events
  - o DOM Methods, DOM Manipulation, Forms & Forms Validation

Module 7: JSON

- JSON: JavaScript Object Notation (JSON)
  - o Introduction and need of JSON o JSON Syntax Rules
  - o JSON Data - a Name and a Value,
  - o JSON Objects, JSON Arrays, JSON Files, JSON parsing

Module 8: Introduction to Node.js

- Introduction to Node.js, Browser JS vs. Node.js
- Node.js REPL

Module 9: Node.js Asynchronous Programming

- Introduction to Asynchronous programming and callbacks
- Promises and async & await
- The Event Loop and Timers

Module 10: Node.js Modules

- Understanding Node modules, exports, and require
- Introduction to npm
  - o package.json and package-lock.json files
  - o Install, update, and manage package dependencies
  - o Local and global packages

Module 11: Node.js Modules – *fs* and *http*

- File I/O – Sync & Async Methods
- HTTP Module – Building an HTTP server
- Developing a Node web application

Module 12: Introduction to Express

- Introduction to Express, Getting started with Express
- Application, Request and Response Objects
- Routes and Middlewares

Module 13: CURD using Express & MYSQL:

- Working with MYSQL
- Performing CURD operations with Express

Module 14: Introduction to React JS:

- Introduction to React, Getting started with React
- React Elements and React Components
- Function and Class Components
- Working with React Components and Props
  - o Compose components, Render components, Declutter components

Module 15: React JS:

- Introduction to State and Lifecycle
- Stateful components and lifecycle methods
- Props vs. State vs. Context
- Handling events, Conditional rendering

Module 16: React JS

- Lists and Keys
  - o Rendering Multiple Components
  - o Basic List Component
- Working with forms and inputs
- Composition vs. Inheritance
  - o Containment & Specialization

Module 17: Express & React JS

- Build React App
- Merging React with Express

Module 18: Capstone Project

Artificial Intelligence and Data Science using Python

Duration: 100 hours

Objective: This course is designed to provide a broad overview of AI and its various applications, including machine learning, deep learning, and computer vision & python. Students will learn about AI, and explore the different types of AI systems.

Prerequisites: Familiarity with the basics of Mathematics, Statistics and Python Programming would be helpful for this course.

Module 1: Introduction of AI

- What is AI?, Terminologies of Artificial Intelligence
- Components of Artificial Intelligence – ML & DL
- Difference between AI, ML, Deep Learning
- History and Evolution of AI, Introduction to Machine Learning
- Find out where AI is applied in Technology and Science.
- Difference between Traditional Programming and ML Programming

Module 2: Basics of Python

- Introduction of python
- Control flow statements (Loops)
- Python Data Structures & Data Types
- Functions, Modules & OOP's Concepts

Module 3: Mathematical Computing using NumPy

- Introduction to NumPy
- Create and Print Numpy Arrays
- Numpy Operations

Module 4: Data Manipulation with Pandas

- Introduction to Pandas
- Pandas Series & DataFrames
- Missing Values, Handling Missing Values
- Various Data Operations

Module 5: Data visualization with Python

- Data Visualization, Considerations of Data Visualization
- Factors of Data Visualization
- Python Libraries
- Create Your First Plot Using Matplotlib
- Line Properties
- Multiple Plots and Subplots,Create a Plot with Annotation
- Create Multiple Subplots Using plt.subplots
- Creating different types of graphs

Module 6: Maths for AI/ML

- Linear Algebra: Vectors, Matrices, Operations, Projections, Dimensionality Reduction
- Calculus: Differentiation & Partial Derivatives, Gradient, Chain Rule, Gradient Descent

Module 7: AI/ML Implementations

- Types of Machine Learning, Labelled Data and Unlabelled Data
- Concept of Supervised & Unsupervised
- Steps of Machine Learning
- Concept of collecting the historic training Data for ML

- Concept of Pre-process data for Machine Learning
- Need for Data Pre-processing
- Data Transforms Steps
- Types of Data Transformation Methods
- Rescale, Standardize & Normalize Data
- Concept of Train the ML model
- Concept of Test the ML Algorithm
- Algos of Regression, Classification & K-Means Clustering
- Concept of Sigmoid Function
- Validation and Evaluations (k-fold, AUC, ROC, Confusion matrix)

Module 8: Introduction to Deep Learning

- A revolution in Artificial Intelligence
- Limitations of Machine Learning
- What is Deep Learning?
- Advantage of Deep Learning over Machine learning

Module 9: Introduction to Neural Networks, Computer Vision & RNN

- Introduction to Neural Networks, Neural Network Architecture, The Neuron
- Introduction to image processing and computer vision,
- Convolutional features for visual recognition
- Object detection, Image classification
- Introduction to RNN & LLM

Module 10: Capstone Project