# GUJARAT TECHNOLOGICAL UNIVERSITY

**Program Name: Master of Computer Applications**
**Level: Post Graduate**
**Course / Subject Code :  MC02094041**
**Course / Subject Name  :  Full Stack Development**

| w. e. f. Academic Year: | 2024-25 |
|---|---|
| Semester: | 2 |
| Category of the Course: | Core Courses |

| Prerequisite: | Fundamental knowledge of computer networking and internet concepts. |
|---|---|
| Rationale: | • To design and develop a robust application<br>• To understand the fundamentals of web programming and client-side scripting.<br>• To learn web server and server-side development using NodeJS.<br>• To understand API development with Express Framework.<br>• To understand and architect databases using NoSQL.<br>• To learn the advanced client-side scripting and ReactJS framework and app implementation in Cloud. |

## Course Outcome:

After Completion of the Course, Student will able to:

| No. | Course Outcomes | RBT Level* |
|---|---|---|
| 1 | To become knowledgeable about the most recent web development technologies and to write client-side scripting HTML, CSS and Ajax. | Remember and Understand |
| 2 | Implement and architect the server side of the web application, javascript and learn and implement express framework, learn and apply JSON. | Understand/ Apply |
| 3 | Learn and implement advanced Node JS and Database, Architect NoSQL databases with MongoDB. | Understand/Apply |
| 4 | To learn the advanced client-side scripting using ReactJS, fetch through API . | Analyze |
| 5 | Create app implementation in Cloud and evaluate. Implement a full-stack Single Page Application using React, NodeJS and MongoDB and deploy on Cloud. | Create/Evaluate |

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

## Course Outcome:

After Completion of the Course, Student will able to:

| No. | Course Outcomes | RBT Level* |
|---|---|---|
| 1 | Explain principles of client-server communication and Design interactive webpages using HTML, CSS, and javascript integrated with AJAX. | RM,UN,AP |

| 2 | Describe and Utilize Node.js and NPM to develop server side applications, serve files with the http module, and implement APIs to fetch JSON data using Express framework. | RM, UN, AP |
|---|---|---|
| 3 | Explain and develop full-stack applications that integrate Node.js with both SQL and NoSQL databases for data handling and operations. | RM, UN, AP |
| 4 | Explain principles of React, including ReactDOM, JSX, and their properties and Develop dynamic and responsive user interfaces by managing state, utilizing local storage, handling events and component communication in React applications. | RM, UN, AP |
| 5 | Discuss services provided by various cloud providers, benefits of Virtual Private Cloud and deploy containerized application at scale using Kubernetes. | RM,UN,AP,AN,EV |

*RM: Remember, UN: Understand, AP: Apply, AN: Analyze, EL: Evaluate, CR: Create

**Teaching and Examination Scheme:**

| Teaching Scheme (in Hours) | | | Total Credits L+T+ (PR/2) | Assessment Pattern and Marks | | | | Total Marks |
|---|---|---|---|---|---|---|---|---|
| | | | | Theory | | Tutorial / Practical | | |
| **L** | **T** | **PR** | **C** | ESE (E) | PA / CA (M) | PA/CA (I) | ESE (V) | |
| 3 | 0 | 2 | 4 | 70 | 30 | 20 | 30 | 150 |

**Course Content:**

| Unit No. | Content | No. of Hours | Weightage (%) |
|---|---|---|---|
| **1** | Introduction to Web: Server - Client - Communication Protocol (HTTP) – Structure of HTML Documents – Basic Markup tags – Working with Text and Images with CSS– CSS Selectors – CSS Flexbox - JavaScript: Data Types and Variables - Functions - Events – AJAX: GET and POST. | 8 | 15% |
| **2** | Introduction to Web Servers – Javascript in the Desktop with NodeJS – NPM – Serving files with the http module – Introduction to the Express framework – Server-side rendering with Templating Engines – Static Files - async/await - Fetching JSON from Express. | 9 | 20% |

| 3 | Advanced Node JS and Database: Introduction to NoSQL databases – MongoDB system overview - Basic querying with MongoDB shell – Request body parsing in Express – NodeJS MongoDB connection – Adding and retrieving data to MongoDB from NodeJS – Handling SQL databases from NodeJS – Handling Cookies in NodeJS – Handling User Authentication with NodeJS. | 10 | 25% |
|---|---|---|---|
| 4 | Advanced Client Side Programming: React JS: ReactDOM - JSX - Components - Properties – Fetch API - State and Lifecycle - -JS Localstorage - Events - Lifting State Up - Composition and Inheritance. | 10 | 25% |
| 5 | App Implementation in Cloud: Cloud providers Overview – Virtual Private Cloud – Scaling (Horizontal and Vertical) – Virtual Machines, Ethernet and Switches – Docker Container – Kubernetes. | 8 | 15% |
| | **Total Hours:** | **45** | |

**Suggested Specification Table with Marks (Theory):**

| Distribution of Theory Marks (in %) | | | | | |
|---|---|---|---|---|---|
| **R Level** | **U Level** | **A Level** | **N Level** | **E Level** | **C Level** |
| 10% | 20% | 30% | 10% | 10% | 20% |

*Where R: Remember; U: Understanding; A: Application, N: Analyze and E: Evaluate C: Create (as per Revised Bloom's Taxonomy)*

**References/Suggested Learning Resources:**

**Textbook:**

1. Internet and World Wide Web:How to Program, Paul Deitel , Harvey Deitel & Abbey Deitel, Pearson Education, 5th Edition, 2018.
2. HTML 5 Black Book (Covers CSS3, JavaScript, XML, XHTML, AJAX, PHP, jQuery), DT Editorial Services, Dreamtech Press, 2nd Edition, 2016.

**Reference Books:**
1. Chris Northwood, The Full Stack Developer: Your Essential Guide to the Everyday Skills Expected of a Modern Full Stack Web Developer, Apress Publications, 1st Edition, 2018.
2. Laura Lemay, Rafe Colburn & Jennifer Kyrnin, Mastering HTML, CSS & Javascript Web Publishing, BPB Publications, 1st Edition, 2016.

3. Matt Frisbie, "Professional JavaScript for Web Developers", Wiley Publishing, Inc, 4th Edition, ISBN: 978-1-119-36656-0, 2019
4. Learning PHP, MySQL, JavaScript, CSS & HTML5: A Step-by Step Guide to CreatingDynamic Websites by Robin Nixon
5. Alex Giamas, Mastering MongoDB 3.x, Packt Publishing Limited, First Edition, 2017.
6. Alex Banks, Eve Porcello, "Learning React", O'Reilly Media, Inc, 2nd Edition, 2020
7. Full Stack JavaScript: Learn Backbone.js, Node.js and MongoDB. Copyright © 2015 Byazat Mardan
8. Mastering Full Stack React Web Development Paperback – April 28, 2017 by TomaszDyl , Kamil Przeorski , Maciej Czarnecki

**Suggested Course Practical List:**

1. Write a program to create a website using HTML CSS and JavaScript.
2. Write a program to build a Chat module using HTML CSS and JavaScript.
3. Build an online MCQ quiz app. The questions and options should be fetched based on the chosen topic from a NodeJS server. The questions can be stored in a JSON file in the backend. Once the user has answered the questions, the frontend must send the chosen options to the backend and the backend must identify the right answers and send the score back to the front end. The frontend must display the score in a separate neatly designed page.
4. Build a blog website where you can add blog posts through a simple admin panel and the users can view the blog posts. The contents of the blog posts can be stored in either MongoDB or MySQL database. The home page should contain the titles of the blog post and the full post can be viewed by clicking the title. Frontend can be built either using React or through template engines served by the NodeJS server.
5. Take Amazon ecommerce or Facebook social media website/app. Analyze what the API endpoints would have been used for and how the frontend interacts with the backend. The networks tab in the browser's developer tools can be used if required.
6. Architect an entire database structure for an E-Commerce application for MongoDB. Discuss how the database would have been structured if you were using a SQL database.
7. Create a Simple Login form using React JS
8. Build a robust Todo List App with ReactJS.
9. Write a program to create a voting application using React JS
10. Build a simple calculator app with React. The user should be able to add numbers and operations to the app by clicking on buttons, just like you would do in a mobile phone. The moment the operation and the two operations are defined, the answer should be displayed
11. Create a project on Grocery delivery application

**List of Laboratory/ Active Learning Assignment:**
   https://www.coursera.org/learn/the-full-stack

https://github.com/topics/full-stack-web-development?l=html
https://www.upgrad.com/blog/skills-to-become-a-full-stack-developer/
https://www.upgrad.com/blog/full-stack-coding-project-ideas-topics-for-beginners/

**Additional Exercises:**
1. Write a program to create and Build a Password Strength Check using Jquery
2. Write a program to create and Build a star rating system using Jquery
3. Create a blog using React JS

**CO- PO Mapping:**

| Semester 2 | Course Name : Full Stack Development | | | | | | | |
|---|---|---|---|---|---|---|---|---|
| | POs | | | | | | | |
| Course Outcomes | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 |
| CO1 | 3 | 3 | 3 | 3 | 0 | 0 | 0 | 0 |
| CO2 | 3 | 3 | 3 | 3 | 0 | 0 | 0 | 0 |
| CO3 | 3 | 3 | 3 | 3 | 0 | 0 | 0 | 0 |
| CO4 | 3 | 3 | 3 | 3 | 0 | 0 | 0 | 0 |
| CO5 | 3 | 3 | 3 | 3 | 2 | 0 | 0 | 0 |

*Legend:  '3' for high,  '2' for medium,  '1' for low and '-' for no correlation of each CO with PO.*

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