[Subject code for Theory-2611000906022001]

[Subject code for Practical-2611000906022002]

Course Code: 603-01
Course Title: Fundamentals of Full Stack Web Development

<table>
<tr><td>Course Code</td><td>603-01</td></tr>
<tr><td>Course Title</td><td>Fundamentals of Full Stack Web Development</td></tr>
<tr><td>Credits</td><td>4</td></tr>
<tr><td>Course Category</td><td>Major Course</td></tr>
<tr><td>Level of Course</td><td>Advance level</td></tr>
<tr><td>Teaching per Week</td><td>2 Hours Theory + 4 Hours of Project work</td></tr>
<tr><td>Minimum Teaching Hours per Semester</td><td>90 Hours (Theory + Project work)
(Including class work, Project work, preparation etc.)</td></tr>
<tr><td>Review / Revision</td><td>-</td></tr>
<tr><td>Implementation Year:</td><td>A.Y. 2025-2026</td></tr>
<tr><td>Cognitive Skills of the Course</td><td>The course enhances analytical thinking by guiding students through the structure and logic of web application development. Learners develop problem-solving skills as they design, debug, and improve client-server interactions. It fosters the ability to break down complex tasks into manageable components, encouraging modular and structured thinking. Students also gain the ability to evaluate and choose appropriate tools and approaches for frontend, backend, and database integration.</td></tr>
<tr><td>Course Objective</td><td>This course introduces students to the fundamentals of full stack web development using Angular, Express.js, and Firebase. Learners will gain hands-on experience building single-page applications (SPAs) using Angular, setting up backend servers with Express.js, and integrating cloud-based databases using Firebase Firestore. The course emphasizes core concepts such as routing, forms, data binding, and basic CRUD operations. Students will understand how frontend and backend components interact in a modern web application. By the end of the course, learners will be able to build simple yet functional web apps and connect them to a real-time database. The focus remains on conceptual clarity, practical application, and foundational skills development.</td></tr>
<tr><td>Pre-requisite</td><td>305-01: Web Designing -1 course of Semester-3.
405-01: Web Designing -2 course of Semester-4.
503-01: Advanced Web Designing – I</td></tr>
<tr><td>Course Outcomes</td><td>CO1: The skills acquired in this course are highly transferable and applicable in a wide range of professional settings.
CO2: Whether students aim to become web developers, designers, or entrepreneurs, proficiency in web development technologies is invaluable.
CO3: Through hands-on projects and exercises, they will gain practical experience in building real-world solutions.
CO4: Students will be able to develop modern, complex, responsive and scalable websites.
CO5: Understand necessary functionalities and elements of cleint and server-side development of website.
<table>
<tr><th>Unit</th><th>Remember</th><th>Understand</th><th>Apply</th><th>Analyze</th><th>Evaluate</th><th>Create</th></tr>
<tr><td>Unit 1</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td>✓</td></tr>
<tr><td>Unit 2</td><td>✓</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td></tr>
<tr><td>Unit 3</td><td></td><td>✓</td><td>✓</td><td>✓</td><td></td><td>✓</td></tr>
<tr><td>Unit 4</td><td>✓</td><td>✓</td><td>✓</td><td></td><td></td><td>✓</td></tr>
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Mapping between Course Outcomes(CO) with Program Specific Outcomes(PSO)

	PSO1	PSO2	PSO3	PSO4	PSO5	PSO6	PSO7	PSO8
CO1								
CO2								
CO3								
CO4								
CO5								

Course Content

Unit 1: Fundamentals of Angular (v17) for Single Page Applications

1.1 Angular Recap & Project Setup
- 1.1.1 Brief Recap of Angular 17 core concepts: Components, Services, Routing
- 1.1.2 Setting up a scalable Angular project using Angular CLI with Standalone Components
- 1.1.3 Folder structure and module organization for large projects

1.2 Advanced Routing & State Handling
- 1.2.1 Implementing Lazy Loading with Feature Modules
- 1.2.2 Route Guards: CanActivate, CanDeactivate for securing routes
- 1.2.3 Route Resolvers for preloading data
- 1.2.4 Introduction to advanced state handling using RxJS Subjects and Behavior Subjects

1.3 Reactive Forms in Real Applications
- 1.3.1 Dynamic form generation using FormArray
- 1.3.2 Custom Validators and Asynchronous Validation
- 1.3.3 Centralized error handling and displaying validation messages
- 1.3.4 Submitting forms to APIs and form state management

1.4 Building Reusable UI Components & Design Patterns
- 1.4.1 Creating reusable card, modal, and alert components
- 1.4.2 Component interaction with RxJS and Shared Services
- 1.4.3 Use of ng-template, ng-container, ng-content for structural flexibility
- 1.4.4 Smart vs Dumb Components: Best practices

1.5 Application Deployment & Performance Optimization
- 1.5.1 Angular build process, environments, and optimization flags
- 1.5.2 Deploying Angular applications using Firebase Hosting
- 1.5.3 Performance tuning: trackBy, OnPush change detection, lazy loading routes/components

Unit 2: Introduction to Express.js and Server-Side Basics with Node.js

2.1 Introduction to Node.js and Express.js
- 2.1.1 Installing Node.js (v20+) and setting up Express server
- 2.1.2 Creating a RESTful backend using Express.js
- 2.1.3 Introduction to nodemon and project structuring

2.2 Handling Routes and HTTP Methods
- 2.2.1 Defining routes using GET, POST, PUT, DELETE
- 2.2.2 Sending responses and working with route/query parameters
- 2.2.3 Connecting routes to controller logic

2.3 Middleware and API Basics
- 2.3.1 Understanding middleware in Express
- 2.3.2 Using built-in and custom middleware (e.g., body-parser, static files)
- 2.3.3 Introduction to CORS and environment variables

Unit 3: Building Web App Components and Backend Integration

3.1 Working with Forms and APIs
- 3.1.1 Handling form submissions in Express
- 3.1.2 Sending JSON responses and extracting request data
- 3.1.3 Connecting Angular forms to Express APIs

3.2 Organizing Code with Models and Controllers
- 3.2.1 Structuring backend with models, services, and controllers
- 3.2.2 Creating data models for users/products using MongoDB (Mongoose)
- 3.2.3 Basic CRUD operations using Express and MongoDB

	3.3 Authentication and Security Basics 3.3.1 Introduction to Firebase Authentication (Email & Password) 3.3.2 Adding user registration and login to Angular frontend 3.3.3 Securing backend routes with Firebase Admin SDK and JWT **Unit 4: Firebase and React Integration** 4.1 Firebase Firestore and Realtime Database 4.1.1 Setting up Firebase project and Firestore database 4.1.2 Performing basic CRUD operations on Firestore (add, read, update, delete) 4.1.3 Structuring collections and subcollections 4.2 Connecting Firebase with Angular and Express 4.2.1 Integrating Firebase SDK in Angular to fetch/store data 4.2.2 Connecting Firebase Admin SDK in Express for backend access 4.2.3 Basic deployment using Firebase Hosting (for frontend) 4.3 Overview of React Frontend for Full Stack Developers 4.3.1 Setting up a basic React app using Vite or Create React App 4.3.2 Understanding JSX, functional components, and hooks (useState, useEffect) 4.3.3 Integrating Firebase in a React app for data access and authentication [Versions recommended: Node.js: v20 LTS or higher, Angular: v17+, Express: v4.x, Firebase: v10 SDK or latest (modular SDK)] [Students will submit E-Document for Project report. One internal guide will be allocated for every ten groups All groups are required to contact their internal guides once a week to endorse their project progress work.][Students are required to complete this project by 10th of February/15th of August(for winter sessions) and submit].
Reference Books	1. Angular: Up and Running: Learning Angular, Step by Step, Shyam Seshadri, O'Reilly Media, Inc. 2. Mastering Web Application Development with AngularJS, Pawel Kozlowski Peter and Bacon Darwin, Packt Publishing 3. Beginning Node.js, Express & MongoDB Development, by Greg Lim, ISBN-13 : 978-9811480287 4. Building Scalable Web Apps with Node.js and Express: Design and Develop a Robust, Scalable, High-Performance Web Application Using Node.js, Express.js, TypeScript, and Redis, Yamini Panchal, Ravi Kumar Gupta, Orange Education Pvt. Ltd, ISBN-13 : 978-8197223815 5. MongoDB, Express, Angular, and Node.js Fundamentals, Paul Oluyege, Packt Publishing, ISBN-13 : 978-1789808735 6. Pro Express.js: Master Express.js: The Node.js Framework For Your Web Development, by Azat Mardan, APress; 1st ed. Edition, ISBN-13 : 978-1484200384 7. Mastering Express.js: A Comprehensive Guide to Node.js Web Development, Rupesh Kumar Tipu, Vandna B, Suman Punia, LAP Lambert Academic Publishing, ISBN-13 : 978-6207808090 8. Express.js: Node.js Framework for Web Application Development, Daniel Green, ASIN: B014FVDVUA, 9. Mastering Firebase: The Complete Guide to Building and Scaling Apps, by Kameron Hussain, Frahaan Hussain, Sonar Publishing, ISBN – 13 979-8223728290 10. The Road to Firebase: Your journey to master Firebase in JavaScript, Robin Wieruch, 2018 edition 11. Firebase Cookbook, Houssem Yahiaoui, Packt Publishing, ISBN-13 : 978-1788296335
Teaching Methodology	Class Work, Discussion, Lab work, Self-Study, Seminars and/or Assignments
Evaluation Method	50% Internal assessment. : - Attendance, Class and home Assignment, Unit test. - Project Assessment, Presentation and viva-voce 50% External assessment. : - Theory written examination