



COMSATS University Islamabad

Department of Computer Science

Course Description Form (CDF)

Course Information

Course Code: CSC337	Course Title: Advanced Web Technologies
Credit Hours: 3(2,1)	Lecture Hours/Week: 2
Lab Hours/Week: 3	Pre-Requisites: CSC336 – Web Technologies

Course Objectives

- To understand the enterprise architecture of web application
- To design and implement scalable and Realtime production grade application in Express.JS
- To implement security on REST API;
- To implement Front End Application using Next.JS;
- To understand how full stack development works;
- To build a full scalable web application and API using latest technologies.

Course Contents

This course provides hands-on learning of current web technologies and production-grade full-stack engineering. Students cover enterprise architecture, REST APIs, security, authentication, OAuth 2.0, OWASP Top 10, and communication approaches including REST, GraphQL, JSON-RPC, and WebSockets. The course emphasizes modern frontend development with Next.js, including routing, rendering, server-side capabilities, performance, caching, scalability, database optimization, testing, and production deployment. Students learn to design, build, secure, optimize, and deploy modern web applications.

Unit wise Major Topics:

Unit	Topic	No of teaching hours
1.	Technological Race: Importance & Selection of Technologies, Course Road Map, Code Organization	2
2.	Architecting the full stack application (Business, infrastructure, application and Data) and use of Microservices	2
3.	API Designing and versioning & Real-Time Communication Technologies: REST, GraphQL, JSON-RPC, Web Sockets and Selecting a suitable approach for given requirements	4
4.	Web Application & API Security: Authentication & Authorization, OAuth 2.0, Web-specific security, API security, OWASP Top 10	5
5.	Performance, Caching, fault tolerance & Scalability: Frontend performance, Web/server caching, Application caching, Database monitoring and performance optimization, Scalability using “Serverless”. Use of Redis, Kafka, Multi Tenancy based SAAS products	5
6.	Production Frontend Development with Next.js: Next.js architecture: Routing and Layout management, Rendering	9

	strategies, Server-side capabilities, Frontend architecture, and Components and deploying the product.	
7.	Testing & Deployment: Web application testing, API testing, Reliability, Observability: Log Levels, Application and Server Monitoring	3
Total contact hours		30

Mapping of CLOs and GAs						
Sr.#	Unit #	Course Learning Outcomes	Blooms Taxonomy Learning Level	GA		
CLO's for Theory						
CLO-1	1	Explain principles and architectures of full-stack web applications.	Understanding	2		
CLO-2	2-4	Apply principles of full-stack web application development to given requirements.	Applying	3-5		
CLO-3	5	Evaluate technologies and architectural approaches for full-stack web application development.	Evaluating	3-5		
CLO-4	6-7	Apply testing, monitoring, security, and deployment practices for web applications	Applying	3-5		
CLO's for Lab						
CLO-5	2-7	Implement full-stack web applications using modern development technologies.	Creating	3-5		
CLO-6	1-7	Develop full-stack web applications using appropriate development practices.	Creating	1,3-6		
CLO Assessment Mechanism						
Assessment Tools	CLO-1	CLO-2	CLO-3	CLO-4	CLO-5	CL0-6
Quizzes	Quiz 1	Quiz 2	Quiz 3	Quiz 4	-	-
Assignments	-	Assignment 1 & 2	Assignment 3	Assignment 4	Lab Assignments	Lab Assignments
Midterm Exam	Midterm Exam	Midterm Exam	Midterm Exam	-	Lab Midterm Exam	Lab Midterm Exam
Final Term Exam	Final Term Exam				Lab Project/Lab Final Term Exam	Lab Project/Lab Final Term Exam

Text and Reference Books

Textbooks:

1. Web Development with Node and Express - Ethan Brown (O'Reilly)
2. Node.js Design Patterns – Mario Casciaro & Luciano Mammino.
3. Designing Data-Intensive Applications, Martin Kleppmann.
4. Real-World Next.js, Michele Riva

Reference Books:

1. Node.js Notes for Professionals, Free Internet Source, 2020.
2. MongoDB: The Definitive Guide - Shannon Bradshaw, Eoin Brazil & Kristina Chodorow
3. The Little MongoDB/Mongoose/Node.js Book - Karl Seguin
4. Official Next.js documentation (learn.nextjs.org)