A. Course Handout (Version 1.0)

Institute/School Name	Chitkara University Institute of Engineering and Technology		
Department Name	Department of Computer Science & Engineering		
Programme Name	Bachelor of Engineering (B.E.), Computer Science & Engineering		
Course Name	Backend Engineering-I	Session	2024-2025
Course Code	23CS006	Semester/Batch	4th/2023
L-T-P(Per Week)	2-0-0	Course Credits	2
Pre-requisite	Basic knowledge Java Script and React	NHEQF Level	05
Course Coordinator	Dr. Kiran Deep Singh	SDG Number	1,2,9

CLO01	Understand the fundamental concept of client-server architecture and implement server-side logic.
CLO02	Build web applications using express.js, including routing, middleware integration, and response handling.
CLO03	Apply different attributes to Manage client states using sessions and cookies.
CLO04	Analyse the EJS templates to create dynamic and reusable front-end components.
CLO05	Design the minor project and generate report using backend Technologies.

1. Objectives of the Course

The scope of the course is to Gain a comprehensive understanding of backend development concepts, including server-side languages, databases, APIs, and server management.

- Students will master one or more programming, such as Javascript and Node.js, focusing on their application in server-side operations.
- Develop skills in designing and implementing databases.
- Learn how to design, build, and test RESTful APIs to facilitate communication between front-end and back- end systems.

2. Course Learning Outcomes

After completion of the course, student should be able to:

	Course Learning Outcome	*POs	**CL	***KC	Sessions
CLO01	Understand the fundamental concept of client-server architecture and implement server-side logic.	PO4, PO7, PO9, PO12	K2	Factual Conceptual	4
CLO02	Build web applications using express.js, including routing, middleware integration, and response handling.	PO1, PO3, PO6, PO8, PO9, PO11	K3	Conceptual Procedural	5
CLO03	Apply different attributes to Manage client states using sessions and cookies.	PO1, PO2, PO5, PO7, PO10	K3	Conceptual Procedural	8
CLO04	Analyse the EJS templates to create dynamic and reusable front-end components.	PO2, PO11, PO12	K4	Procedural	6
CLO05	Design the minor project and generate report using backend Technologies.	PO3, PO4, PO5, PO10	K5	Conceptual Procedural	5

Total	30

Revised Bloom's Taxonomy Terminology
* PO's available at (shorturl.at/cryzF)
**Cognitive Level =CL
***Knowledge Categories = KC

Course Learning Outcomes	PO 1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CLO01				M			L		H			M
CLO02	L		M		M	H		M			M	
CLO03	M	L			L		M			H		
CLO04		M									L	L
CLO05			M	M	H		H			L		

H=High, M=Medium, L=Low

3. ERISE Grid Mapping

Feature Enablement	Level(1-5, 5 being highest)
Entrepreneurship	1
Research	3
Innovation	2
Skills	5
Employability	4

4. Recommended Books:

Text Books:

B01: Node.js, MongoDB and Angular Web Development, 2nd Edition, Brad Dayley, Brendan Dayley, Caleb Dayley, Oreilly Publications, 2017.

BO2: Beginning Node.js, Express & MongoDB Development by Greg Lim, September 2020

B03: Node.js Design Patterns: Design and Implement Production-Grade Node.js Applications Using Proven Patterns and Techniques, Mario Casciaro and Luciano Mammino, Packt Publishing , 3rd Edition (2020)

Reference Books:

B04: Web Development with Node and Express: Leveraging the JavaScript Stack, Ethan Brown O'Reilly Media, 2019

B05: SQL Database Programming Hardcover by Tim Warren, 2020

E-Resources:

https://library.chitkara.edu.in/subscribed-books.php

5. Other readings and relevant websites:

Serial No	Link of Journals, Magazines, websites and Research Papers
1.	https://nodejs.org (Docs + Examples)

2.	https://www.npmjs.com (Docs + Examples)
3.	https://firebase.google.com/docs/server/setup
4.	https://www.mongodb.com/products/platform/atlas-database

6. Recommended Tools and Platforms

Node JS, React JS
NPM, VS Code, MongoDB Atlas.

7. Course Plan:

Lecture Number	Topics	Textbook
1	**Detail Discussion of Course Handout (CHO)**	
2	Introduction to Client Server Architecture, Understanding Server and how request is handled at the server.	B01-Chpater-1
3-4	Understanding Nodejs, advantages and disadvantages with respect to the available languages, Install nodeJS and create a nodejs server.	B01-Chapter-1
5-6	handling request, creating endpoints, Modules, npm, import Modules, Handling static pages with file stream, Handling exceptions.	B02-Chapter-2
7-8	Frameworks, Different frameworks of NodeJs. Introduction to express, Serve static files. Routing (Routing methods, Route paths, Route parameters, Route Handlers), Response Methods.	B02-Chapter-3, B01-Chapter-6
9-10	Middleware: Middleware lifecycle, Application-level, middleware, Router-level middleware, Error-handling middleware and Third-party middleware.	B01-Chapter-7 B01-Chapter-8
11-12	How request travels in express, Blocking vs non-blocking code - Body parser	B02-Chapter-6
Project Based Evaluation – 1 (Lecture number 1-12)		
13-14	Introduction to Multer, Disk Storage handling. Client state management: Client state management using session module, Different ways of managing session	B02-Chapter-14 B02-Chapter-15
15-16	Authentication, Authorization, and Handling Exceptions during Authentication and authorization.	B01-Chapter-10
17-18	JSON web token, Authentication using JSON, Authentication using JSON using Web Tokens	B01-Chapter-11
19-20	Rendering, Client-side rendering, Server-side rendering, Comparison between CSR and SSR	B02-Chapter-12
21-22	Template Engines, How to use the EJS template in your Node.js application, Create the EJS Partials, Pass Data to Views and Partials, and Live the application with EJS.	B01-Chapter-17 B02-Chapter-18
23-24	Practical (Modify the EJS template to handle arrays of data. Use looping constructs (for, for Each) in the template to iterate over the array data and merge it into the template for dynamic rendering.)	B01-Chapter-17
Project Based Evaluation – 2 (Lecture number 13-24)		
25-26	Create reusable EJS partials for common UI components such as header, footer, and sidebar. Then, merge these partials into the main EJS template to construct the complete UI dynamically.	B01-Chapter-18
27-28	Introduction to databases, SQL and No SQL Databases.	B04-Chapter-1
29-30	Connecting MongoDB with NodeJS application	B03-Chapter-1

8. Delivery/Instructional Resources

Lecture No.	Topics	Web References	Audio-Video
1	Detail Discussion of Course Handout (CHO)		
2	Introduction to Client Server Architecture, Understanding Server and how request is handled at the server.	https://www.simplilearn.com/what-is-client-server-architecture-article	https://www.youtube.com/watch?v=zEn93Km_CdM
3-4	Understanding Nodejs, advantages and disadvantages with respect to the available languages, Install nodeJS and create a nodejs server.	https://www.geeksforgeeks.org/node-js-introduction/	https://www.youtube.com/watch?v=WjzLVU-aFXI
5-6	handling request, creating endpoints, Modules, npm, import Modules, Handling static pages with file stream, Handling exceptions.	https://expressjs.com/en/guide/routing.html	https://www.youtube.com/watch?v=YazJFb_i4A0
7-8	Frameworks, Different frameworks of NodeJs. Introduction to express, Serve static files. Routing (Routing methods, Route paths, Route parameters, Route Handlers), Response Methods.	https://www.geeksforgeeks.org/how-to-use-routes-with-serve-static-files-in-node-js/	https://www.youtube.com/watch?v=YazJFb_i4A0
9-10	Middleware: Middleware lifecycle, Application-level, middleware, Router-level middleware, Error-handling middleware and Third-party middleware.	https://expressjs.com/en/guide/using-middleware.html	https://www.youtube.com/watch?v=bRqUaDRm8Po&t=134s
11-12	How request travels in express, Blocking vs non-blocking code - Body parser	https://nodejs.org/en/learn/asynchronous-work/overview-of-blocking-vs-non-blocking	https://www.youtube.com/watch?v=O9tU97F4bfU
13-14	Introduction to Multer, Disk Storage handling. Client state management: Client state management using session module, Different ways of managing session	https://www.geekster.in/articles/introduction-to-multer/	https://www.youtube.com/watch?v=rfSJeox61vA
15-16	Authentication, Authorization, and Handling Exceptions during authentication and authorization.	https://medium.com/@minadev/authentication-and-authorization-with-spring-security-bf22e985f2cb	https://www.youtube.com/watch?v=B76BhEq1FN8
17-18	JSON web token, Authentication using JSON, Authentication using JSON using Web Tokens	https://www.geeksforgeeks.org/json-web-token-jwt/	https://www.youtube.com/watch?v=xrj3zzaqODw
19-20	Rendering, Client-side rendering, Server-side rendering, Comparison between CSR and SSR	https://www.geeksforgeeks.org/how-does-ssrserver-side-rendering-differ-from-csrclient-side-rendering/	https://www.youtube.com/watch?v=OobrSuDYMl1s

21-22	Template Engines, How to use the EJS template in your Node.js application, Create the EJS Partials, Pass Data to Views and Partials, and Live the application with EJS.	https://www.geeksforgeeks.org/use-ejs-as-template-engine-in-node-js/	https://www.youtube.com/watch?v=Kah88N8W5rs
23-24	Practical (Modify the EJS template to handle arrays of data. Use looping constructs (for, for Each) in the template to iterate over the array data and merge it into the template for dynamic rendering.)	https://www.geeksforgeeks.org/how-to-use-array-of-objects-in-ejs-template-engine/	https://www.youtube.com/watch?v=YWyr7Nug2oc
25-26	Create reusable EJS partials for common UI components such as header, footer, and sidebar. Then, merge these partials into the main EJS template to construct the complete UI dynamically.	https://ejs.co/	https://www.youtube.com/watch?v=vPFVwMSeKZM
27-28	Introduction to databases, SQL and No SQL Databases.	https://www.geeksforgeeks.org/difference-between-sql-and-nosql/	https://www.youtube.com/watch?v=iAdTs4hVK8E
29-30	Connecting MongoDB with NodeJS application	https://www.geeksforgeeks.org/how-to-connect-node-js-to-a-mongodb-database/	Connecting MongoDB with NodeJS application

9. Lab Plan:

S. No.	Experiments	Learning Resource
1	Testpad Module Progress and Completion	Student's Testpad Portal of Chitkara University

10. Action plan for different types of learners

Slow Learners	Average Learners	Fast Learners
• Remedial Classes on Saturdays • Encouragement for improvement using Peer Tutoring • Use of Audio and Visual Materials • Use of Real-Life Examples	• Workshops • Formative Exercises used to highlight concepts and notions • E-notes and E-exercises to read ahead of the pedagogic material.	• Engaging students to hold hands of slow learners by creating a Peer Tutoring Group • Design solutions for complex problems • Design solutions for complex problems • Presentation on topics beyond those covered in CHO

11. Evaluation Scheme & Components:

Evaluation Component	Type of Component	No. of Assessments	Weightage of Component	Mode of Assessment
Component 1	Test pad Module Progress and completion	-	10%	Online
Component 2	Project Based Evaluation	02*	50%	Offline
Component 3	Final Project Based Evaluation	01**	40%	Offline
Total			**100%**	

* Students will have to appear in all Project Based Evaluations.

**As per Academic Guidelines minimum 75% attendance is required to become eligible for appearing in the End Semester Examination.

12. Syllabus of the Course:

S. No.	Topic (s)	No. of Sessions	Weightage %
1	Introduction to Client Server Architecture, Understanding Server and how request is handled at the server. Understanding Nodejs, advantages and disadvantages with respect to the available languages, Install nodeJS and create a nodejs server. handling request, creating endpoints, Modules, npm, import Modules, Handling static pages with file stream, Handling exceptions. Frameworks, Different frameworks of NodeJs. Introduction to express, Serve static files. Routing (Routing methods, Route paths, Route parameters, Route Handlers), Response Methods. Middleware: Middleware lifecycle, Application-level, middleware, Router-level middleware, Error-handling middleware and Third-party middleware. How request travels in express, Blocking vs non-blocking code -Body parser.	12	25%
Project Based Evaluation - 1			
2	Introduction to Multer, Disk Storage handling. Client state management: Client state management using session module, Different ways of managing session. Authentication, Authorization, and Handling Exceptions during authentication and authorization. JSON web token, Authentication using JSON, Authentication using JSON using Web Tokens Rendering, Client-side rendering, Server-side rendering, Comparison between CSR and SSR Template Engines, How to use the EJS template in your Node.js application, Create the EJS Partials, Pass Data to Views and Partials, and Live the application with EJS. Practical (Modify the EJS template to handle arrays of data. Use looping constructs (for, for Each) in the template to iterate over the array data and merge it into the template for dynamic rendering.)	12	**25%**
Project Based Evaluation - 2			
3	Create reusable EJS partials for common UI components such as header, footer, and sidebar. Then, merge these partials into the main EJS template to construct the complete UI dynamically. Introduction to databases, SQL and No SQL Databases. Connecting MongoDB with NodeJS application.	6	**50%**
Final Project Based Evaluation			

This Document is approved by:

Designation	Name	Signature
Course Coordinator	Dr. Kiran Deep Singh	
Head-Academic Delivery	Dr. Mrinal Paliwal	
Dean	Dr. Rishu Chhabra	
Date	30.11.2024	