Institute/ School Name	School of Engineering and Technology		
Department Name	Department of Computer Science & Engineering		
Program Name	Bachelor of Engineering (Computer Science & Engineering): B.E (CSE)		
Course Code	25CS022	Course Name	Back-end Engineering
L-T-P (Per Week)	3-0-2	Course Credits	04
Academic Year	2025-26	Semester/Batch	5th /2023-27
Course Coordinator	Ms. Ravita Chahar		

1. Course Outline:

Introduction, client & server architecture, Node.js introduction, handle web request for static files, using middleware and their structure, Nodejs Express, Session management, working on JSON data, Authentication and Authorization, uploading files using multer, connectivity with database MongoDB and implementing ODM using mongoose, handling CRUD Operations, and working on MongoDB Atlas. Ecommerce Project management and different Project phases.

2. Programme Outcomes (POs):

At the end of the programme, students will be able to achieve knowledge about the following:	
PO 1	**Engineering knowledge**: Apply the knowledge of mathematics, science, engineering fundamentals, and an engineering specialization to the solution of complex engineering problems.
PO 2	**Problem analysis**: Identify, formulate, review research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.
PO 3	**Design/development of solutions**: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations.
PO 4	**Conduct investigations of complex problems**: Use research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions.
PO 5	**Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations.
PO 6	**The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to the professional engineering practice.
PO 7	**Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development.
PO 8	**Ethics**: Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practice.
PO 9	**Individual and teamwork**: Function effectively as an individual, and as a member or leader in diverse teams, and in multidisciplinary settings.
PO10	**Communication**: Communicate effectively on complex engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions.
PO11	**Project management and finance**: Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments.
PO12	**Life-long learning**: Recognize the need for and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change.

3. Course Learning Outcomes (CLO):

After completing the course, the students will be able to:

CLO1: Understand the core concepts of backend technologies using Node.js and MongoDB to build foundational skills in server-side development.
CLO2: Create a Node.js server to handle HTTP requests and define API endpoints, developing practical skills in backend architecture and API design.
CLO3: Implement session management, JWT-based authentication, and routing in Node.js applications to strengthen backend security skills and web development proficiency.
CLO4: Perform CRUD operations using MongoDB and analyze their effectiveness in real-time applications to enhance database management skills and improve employability in backend roles.
CLO5: Develop real-time communication features using Socket.io in backend systems to build industry-relevant skills in real-time application development and increase career readiness.

4. CLO-PO Mapping Matrix:

Course Learning Outcomes	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PO12
CLO1	H					M						H
CLO2	H	L	H					L	L			
CLO3	L	L							M	L		M
CLO4			M	L				M			L	
CLO5	M		L		H				M		M	M

5. ERISE Grid Mapping:

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

6. Recommended Books (Reference Books/Text Books):

B01: Pasquali, S. (2nd Edition). Mastering Node.js. Packt Publishing Ltd.
B02: Horvś, D., Mernbrey, P., & Plugge, E. (1st Edition). MongoDB Basics. Apress
B03: Haverbeke, M. (3rd Edition). Eloquent JavaScript. No Starch Press.

7. Other readings and relevant websites:

Resources	Link of Journals, Magazines, Websites and Research Papers
R1	https://www.w3schools.com/nodejs/
R2	https://www.geeksforgeeks.org/nodejs/
R3	https://web.stanford.edu/class/cs142/lectures/NodeJS.pdf
R4	https://www.mongodb.com/docs/mongodb-shell/

Resources	Link of Audio-Video resources
V1	https://www.youtube.com/watch?v=TlB_eWDSMt4
V2	https://www.youtube.com/watch?v=RLtyhwFtXQA
V3	https://www.youtube.com/watch?v=pWbMrx5rVBE
V4	https://www.youtube.com/watch?v=32M1al-Y6Ag

* Resources uploaded on ERP system is accessible to all the students registered for the course.

8. Recommended Tools and Platforms:

- Visual Studio Code, Nodejs, MongoDB, Git
- Testpad: https://testpad.chitkarauniversity.edu.in

9. Course Plan:

Lecture Number	Topics	Weightage in ETE (%)	Resources
1-2	Introduction to client Server Architecture Understanding Server and how request is handled	10	B01, V1, R1
3-4	Node Introduction: Understanding Nodejs, advantages and disadvantages, Folder structure and basic Node server and understanding modules, Request and response lifecycle		
5-7	Practice Problem: Installation Nodejs: Understanding Folder structure, package.json and modules [user defined and in-built]		
8-10	Creating basic node server, handling request, creating endpoints, Modules, import modules	20	B01, B02, V2, R2
11-13	Practice Problem: Creating a basic HTTP Server and returning different types of content in Node.js		
14-16	Handling static pages with file stream, Handling exception, callback and other methods of endpoints,		B02, V2. R1
17-18	Practice Problem: Hosting static pages using basic server covering exceptions		
19-21	Introduction to Express- Request lifecycle in express, how request travels in express, blocking vs non-blocking code, Handling static file		B01, B03, R3, V2
22-23	Practice Problem: Express: creating server using Express		
24-26	Routing and different type like Static, Dynamic		B01, B02, V2, R3
27-30	Practice Problems: • Static routing using express of static web pages • Filter Products from Json file using Dynamic Routing		
31-33	Intro to middleware's- Middleware lifecycle, serve static files, Body parser, Introduction to Multer	10	B01, V3, R3, R4
34-35	Practice Problems: • Create an article with image (Using Multer) • Accepting form data using body parser		
36-37	Disk storage and File Filter handling in Multer		
38-39	Practice Problem: Apply constraint on image file based on type and image size		
40-41	Client state management Introduction, Client state management using session module, Different ways of managing session, Node style async error handling	10	B01, B02, V3, R2
42-43	Practice Problem: Creating Login Signup page using session		
44-45	Authentication, Authorization, Handling Exceptions during auth. And authentication		B02, B03, V2, R4

46-47	Practice Problems: • Creating a dashboard for the user. Apply Authentication to make sure only logged in users will be able to access the dashboard • Create an end point only accessible by user with role admin		
48-51	JSON web token, Authentication using JWT	10	
52-53	SSR - How to use EJS to template your Node.js application, Create the EJS Partials, Pass Data to Views and Partials		B01, B02, V2, V1, R3
54-54	Practice Problem: Live application with EJS, Login/Signup and dashboard		
55-56	Introduction to databases, SQL and No SQL Databases, MongoDB Shell and MongoDB Compass Installation, MongoDB Shell and commands	20	B01, B02, V1, V2, R2
57-58	Practice Problem: MongoDB command-line Interface creating database, collection, different operations on Database		
59-60	MongoDB Compass: Connecting MongoDB with NodeJS application, Applying CRUD operations on database		B01, B02, V2, V3, R4
61-62	Practice Problems: • Connecting MongoDB with Nodejs application using sign up pages • Applying CRUD operations on database		
63-64	Applying CRUD operations on database and creating Pages using EJS	20	B01, B02, V4, R1
65-66	Practice Problems: • Applying CRUD operations on database • Ecommerce Home Page to display products		
67-68	Introduction to Mongoose (ODM), Basic Schema definition, Advance Schema Definition and validations, Dummy data and error handling in mongoose		B01, B02, B03, V2, R2
69-69	Practice Problem: Login Management using Mongoose with ATLAS		
70-71	CRUD Operations using Mongoose with validation		
72-75	Socket.io, Creating a Chatting Application		

10. Industry Interventions:

- The students will receive resources on the LMS system, and their progress will be tracked on the platform based on their submissions (number of submissions, errors encountered, and optimized solutions).
- Industry Curated Module: https://testpad.chitkarauniversity.edu.in

11. Innovative Pedagogies:

- Project Based Learning

12. Action plan for different types of learners

Slow Learners	Average Learners	Advanced Learners
Remedial Classes	Workshops / Practice Assignment*	Advanced Problems*

* The practice test will be assigned on the LMS platform for both average and advanced learners.

13. Evaluation Scheme & Components:

Evaluation Component	Type of Component	No. of Assessments	Weightage of Component	Mode of Assessment (Offline/ Online)
Internal Component	Sessional Tests (STs)	02*	40%	Online**
External Component	End Term Examination (ETE)	01	60%	Online**
Total		**100%**		

* Out of the two, the best 01 will be considered.
** Proctored examination will be conducted on Testpad platform.

14. Details of Evaluation Components:

Evaluation Component	Description	Syllabus Covered (%)	Timeline of Examination	Weightage (%)
Internal Component	ST 01	Up to 40 (Lectures 1-30)	Week 5	40
	ST 02	41 - 80 (Lectures 31-60)	Week 9	
External Component	End Term Examination*	100	As Notified by the Exam Cell	60
Total				100

* Minimum 75% attendance is required to become eligible for appearing in the End Term Examination

15. Format of Evaluation Components:

Type of Assessment	Total Marks	1 Mark MCQ	2 Marks MCQ	5 Marks Coding Question	10 Marks Coding Question
Sessional Tests	40	10	5	2	1
End Term Examination	60	10	10	2	2

16. Revision (if any):

Academic Year of Previous Version	2024-2025	Percentage of Revision	8%

Topics Added:

- JSON web token, Authentication using JWT
- Socket.io, Creating a Chatting Application

Topics Deleted: NA

17. This Document is:

Designation	Name	Signature
Prepared by Course Coordinator	Ms. Ravita Chahar	
Verified by Assistant Dean	Dr. Ashutosh Kumar Dubey | Ms. Ravita Chahar	
Approved by Pro VC	Prof. (Dr.) Meenu Khurana	
Date	23rd June 2025	