

Course Handout

Institute/School Name	Chitkara University Institute of Engineering & Technology		
Department Name	Department of Computer Science and Engineering		
Programme Name	B.E - Computer Science & Engineering		
Course Name	Front End Engineering-II	Session	July – Dec 2025
Course Code	24CSE0211	Semester/Batch	3 rd /2024
L-T-P(Per Week)	0-0-6	Course Credits	3
Pre-requisite	Front End Engineering-I	NHEQF Level ¹	Level 5
Course Coordinator	Dr. Kiran Deep Singh	SDG Number ⁴	4, 8, 9

1. Objectives of the Course

This course Front End Engineering-II is designed to provide students with comprehensive, hands-on experience in building responsive and dynamic web applications. Through a structured learning path that starts from web fundamentals and progresses to modern frameworks and deployment strategies, students will gain the technical expertise and creative confidence needed for real-world frontend development. The main objectives are:

- To develop proficiency in building a strong foundation in web development by learning how the internet works and applying core technologies such as HTML and CSS to create structured, semantic, and responsive web pages.
- To develop interactive web applications by using JavaScript to implement dynamic behaviors, manipulate the DOM, perform client-side validations, and fetch data asynchronously via RESTful APIs and JSON.
- To apply project-based learning by designing and developing a static responsive website (e.g., Book Store App), reinforcing HTML, CSS, and JavaScript concepts through real-world implementation.
- To gain practical experience with version control systems, enabling collaborative development using Git and GitHub, including branching, merging, and project history tracking.
- To explore modern JavaScript frameworks and tools, including React for building component-based user interfaces, GraphQL for handling API queries, and Astro for static site generation.
- To synthesize and apply all acquired skills in a final project, demonstrating proficiency in front-end engineering through complete application design, development, integration, and deployment.

2. Course Learning Outcomes (CLOs)

Student should be able to:

	CLOs	Program Outcomes (PO)	NHEQF Level Descriptor	No. of Lectures
CLO01	Understand and explain how the internet works, including concepts like HTTP, DNS, domain names, hosting, and browsers.	PO3, PO4, PO11	Q1, Q2, Q3	12
CLO02	Design and structure web pages using semantic HTML and apply CSS techniques for responsive layouts, form validation, accessibility, and SEO.	PO3, PO4	Q2, Q3	14
CLO03	Develop static responsive web applications using HTML, CSS, and JavaScript, incorporating DOM manipulation, client-side validation, and asynchronous data handling using REST APIs and JSON.	PO5, PO7, PO11	Q2, Q3, Q4	14
CLO04	Utilize version control and Build dynamic, component-based web applications using React, with concepts like JSX, state management, props, hooks, and routing to create a responsive Book Store App.	PO11	Q3, Q4, Q5	18
CLO05	Explore modern web development techniques using GraphQL for data management and Astro for static site generation	PO7, PO9	Q4, Q5	16
CLO06	Demonstrate front-end engineering skills through end-to-end project development, integration, and deployment.	PO5, PO10, PO11	Q3, Q4, Q5, Q6	16
Total Contact Hours				90

CLO-PO Mapping

CLO	PO1	PO2	PO3	PO4	PO5	PO6	PO7	PO8	PO9	PO10	PO11	PSO1	PSO2	Type of Assessment's
CLO01			M	M						H	H	H	M	Formative
CLO02			M	M								M	M	Formative
CLO03					H		M				M	M	H	Formative
CLO04											H	M	H	Formative
CLO05							M		H			H	M	Formative
CLO06					M					M	H	H	H	Formative

H=High, M=Medium, L=Low

3. Recommended Books:

- B01:** 'Web Enabled Commercial Application Development using HTML, JavaScript, DHTML and PHP' by Ivan Bayross, 4th Edition, BPB Publications.
- B02:** 'The Complete Reference HTML & XHTML' by Thomas Powell, 5th Edition, Tata McGraw-Hill Company Limited.
- B03:** 'HTML 4.0' by E. Stephen Mack, Janan Platt, Anaya Multimedia publication.
- B04:** 'Mastering HTML, CSS & JavaScript Web Publishing' by Laura Lemay, Rafe Coburn, Jennifer Kyrmin, 7th edition, SAMS publication.
- B05:** 'Learning web designing: A beginner's guide to HTML, CSS, JavaScript, and Web Graphics' by Niederst Robbins, 4th Edition, Oreilly Publication.

4. Other readings and relevant websites:

Serial No	Link of Journals, Magazines, websites and Research Papers
1.	https://developer.mozilla.org/en-US/docs/Web/HTML
2.	https://bennettfeely.com/flexplorer/
3.	https://onlinecourses.swayam2.ac.in/nou24_cs09/preview
4.	https://javascript.com/
5.	https://developer.mozilla.org/en-US/docs/Web/API/Document_Object_Model

5. Recommended Tools and Platforms

- Any Text Editor like Notepad++, Sublime, Visual Studio Code etc.

6. Course Plan: Lab Plan

Lecture No.	Topic	Detailed Contents
1-6	HTTP Fundamentals	How does the internet work?, HTTP, Domain Name, What is hosting?, DNS and how it works?, Browsers and how they work? HTTP Methods
7-18	HTML and CSS	Learn the basics, Writing Semantic HTML, Forms and Validations, Accessibility, SEO Basics
19-26		Learn the CSS basics, Making Layouts, Media Queries, Responsive Design
Project Based Evaluation – 1 (Lecture number 1-26)		
27-38	Javascript and Developing Web Apps	Learn the JS Programming Basic - Data Types, Variables, Control Flows, Functions, Arrays, JSON Objects
39-44		JS Validation Methods and DOM Manipulation
45-56		Learn REST API with JSON Server
57-62		Fetch API / Ajax (XHR) with JSON Server
Project Based Evaluation – 2 (Lecture number 1-62)		
63-66	Version Control Systems	GitHub-GitHub workflows for collaborative projects, Git: commits, branches, merge, and history
67-74	React Workshop	Demonstrate Book store App with React Components, PWA
75-76	GraphQL	GraphQL Queries, Mutations, Subscriptions, Schema, Validation, Execution, Serving Over Internet, Pagination, Frontend Implementations, Browser APIs
77-78	Static Site Generators	Introduction to Astro and generating static sites for speed and SEO
79-90	Project work	Apply all skills in a full project with deployment
Final Project Based Evaluation (Lecture number 1-90)		

7. Delivery/Instructional Resources:

Lab Plan:

Lect. No.	Topics	CLO	TLM	ALM	Web References	Audio-Video
1-6	HTTP Fundamentals	CLO01, CLO02, CLO04	Lecture, Hands-on, Discussion	Think-Pair-Share, Quiz, One Minute Paper	https://developer.mozilla.org/en-US/docs/Web https://developer.mozilla.org/en-US/docs/Web/HTML https://developer.mozilla.org/en-US/docs/Web/JavaScript/Guide	https://onlinecourses.swayam2.ac.in/nou20_cs05/preview https://nptel.ac.in/courses/106105084 https://www.youtube.com/watch?v=qoSksQ4s_hg
7-18	HTML and CSS	CLO02	Practice	Quiz, Think/Pair/ Share	https://developer.mozilla.org/en-US/docs/Web https://css-tricks.com/	https://nptel.ac.in/courses/106106222 https://www.youtube.com/watch?v=h_RftxdJTzs
19-26		CLO04	Practice	Quiz, Think/Pair/ Share	https://developer.mozilla.org/en-US/docs/Web/API/Document_Object_Model	https://nptel.ac.in/courses/106105084
27-38	Javascript and Developing Web Apps	CLO06	Lecture Practice +	Focused Listing, Brainstorm	https://reactjs.org/docs/hooks-intro.html https://reactrouter.com/en/main	https://www.youtube.com/watch?v=O6P86uwfdR0
39-44		CLO04, CLO05	Lecture Practice +	Quiz, Focused Listing	https://developer.mozilla.org/en-US/docs/Web/JavaScript/Guide	https://nptel.ac.in/courses/106105084 https://www.youtube.com/watch?v=qoSksQ4s_hg
45-56		CLO04	Lecture Practice +	Quiz, Think/Pair/ Share	https://developer.mozilla.org/en-US/docs/Web/API/Document_Object_Model	https://nptel.ac.in/courses/106105084
57-62		CLO06	Lecture Practice +	Focused Listing, Brainstorm	https://reactjs.org/docs/hooks-intro.html https://reactrouter.com/en/main	https://www.youtube.com/watch?v=O6P86uwfdR0
63-66	Version Control Systems	CLO06	Hands-on, Discussion	Peer Activity, Quiz	https://docs.github.com/en https://docs.npmjs.com/ https://reactjs.org/docs/getting-started.html	https://www.youtube.com/watch?v=RG0j5yH7evk https://onlinecourses.swayam2.ac.in/aic20_sp11/unit=4&lesson=7
67-74	React Workshop	CLO06	Lecture Practice +	Focused Listing, Brainstorm	https://reactjs.org/docs/hooks-intro.html https://reactrouter.com/en/main	https://www.youtube.com/watch?v=O6P86uwfdR0
75-76	GraphQL	CLO06	Lecture + Demo	Problem Solving	https://graphql.org/learn/ https://www.apollographql.com/docs/	https://www.youtube.com/watch?v=ed8SzALpx1Q
77-78	Browser APIs & Static Site Generators (Astro)	CLO06	Lecture + Demo	Quiz	https://docs.astro.build/ https://developer.mozilla.org/en-US/docs/Web/API	https://www.youtube.com/watch?v=9gU5hEF0hmk
81-90	Project Work & Final Evaluation	CLO06	Hands-on Project	Peer Evaluation	Project Tools (GitHub, Vercel, Netlify)	https://www.youtube.com/watch?v=nhBVL41_Cw

8. Remedial Classes¹

After every Continuous Evaluation, different types of learners will be identified and special discussions will be planned and scheduled accordingly.

Action Plan for different types of learners:

Learner Type-I	Learner Type- II	Learner Type- III
Remedial Classes, Doubt Sessions, Guided Tutorials	Workshop, Doubt Session	Coding Competitions, Project

9. Self-Learning²

Assignments to promote self-learning, survey of contents from multiple sources.

S.No	Topics	CLO	ALM	References/MOOCs
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¹ Refer to Annexure

² Refer to Annexure

1	HTML structure, tags, forms, semantic elements, accessibility principles, and SEO. CSS basics, layouts, Flexbox, media queries, and responsive design techniques for building adaptive UIs.	CLO01- CLO02	Leading Question, Test Questions, and Practical Assignments	Coursera- HTML, CSS, and Javascript for Web Developers https://www.coursera.org/learn/html-css-javascript-for-web-developers
2	JavaScript programming fundamentals: variables, functions, arrays, control flows, JSON, DOM manipulation, form validation, and fetching data using REST APIs (AJAX, JSON Server).	CLO03	Leading Question, Test Questions, Brain Storming, and Practical Assignments	Coursera- Responsive Website Development and Design Specialization https://www.coursera.org/specializations/website-development https://frontendmasters.com/courses/api-design/
3	Git and GitHub for version control, enabling real-world collaboration through commits, branching, and merging. Build dynamic SPAs using React fundamentals, GraphQL for API handling and Astro for static site generation focused on performance.	CLO05- CLO06	Leading Question, Test Questions, Brain Storming, and Practical Assignments	GitHub Docs - Git Handbook https://docs.github.com/en/get-started/using-git React Official Docs https://react.dev/learn https://graphql.org/learn/

10. Delivery Details of Content Beyond Syllabus³

Content beyond syllabus covered (if any) should be delivered to all students that would be planned, and schedule notified accordingly.

S.No	Advanced Topics, Additional Reading, Research papers	CLO	POs	ALM	References/MOOCs
1	Introduction to React, Understanding the basics of React, its virtual DOM concept, JSX, and component model	CLO06	PO7, PO10, PO11	Think Pair Share, Brain Storming	https://legacy.reactjs.org/tutorial/tutorial.html https://www.coursera.org/learn/front-end-react (https://www.coursera.org/learn/front-end-react)
2	Performance Optimization in React – Lazy loading, memoization, code splitting, and rendering optimization	CLO06	PO7, PO9, PO11	Case Study, Peer Teaching	https://reactjs.org/docs/optimizing-performance.html https://www.coursera.org/learn/advanced-react
3	GraphQL vs REST APIs – Comparative understanding, use cases, real-world implementation challenges	CLO06	PO5, PO10	Panel Discussion, Research Review	https://www.howtographql.com/ (https://www.howtographql.com/) https://www.udemy.com/course/graphql-with-react-course/
4	Web Accessibility semantic HTML, keyboard navigation for inclusive design	CLO01, CLO02	PO3, PO4, PO11	Interactive Demo, Role Play	https://webaim.org/intro/ (https://webaim.org/intro/) https://www.coursera.org/learn/web-accessibility (https://www.coursera.org/learn/web-accessibility)

11. Evaluation Scheme & Components:

Assessment Type	Evaluation Component	Type of Component ⁴	No. of Assessments	% Weightage of Component	Max. Marks	Mode of Assessment	CLO
Formative	Component 1	Project-based Evaluation 1	01*	30%	30	Viva Voce, PPT Presentation, File work	CLO01- CLO02
Formative		Project-based Evaluation 2	01*	30%	30	Viva Voce, PPT Presentation, File work	CLO01- CLO04
Summative	Component 2	Final Project-based Evaluation	01**	40%	40	Project , Viva Voce, PPT Presentation, File work	CLO01- CLO06
Total			100%				

³ Refer to Annexure

* Students will have to appear in all the Project-based evaluations.

* Makeup Examination will compensate for either Project-based Evaluation 1 or Project-based Evaluation 2 (Only for genuine cases, based on the Dean's approval).

** As per Academic Guidelines, a minimum 75% attendance is required to become eligible for appearing in the Final Project-based Evaluation.

** No makeup exam will be taken for Final Project-based Evaluation

12. Syllabus of the Course:

Subject : Front End Engineering -II			
S.No.	Topic (s)	No. of Lectures	Weightage %
1	Web Fundamentals: HTML, CSS, Internet Basics, HTTP, DNS, Git & GitHub	26	29%
2	JavaScript Programming & Dynamic Web Development (JS, DOM, Validation, REST APIs, JSON, Ajax)	36	40%
3	React Basics: Components, JSX, State, Hooks, Routing, and SPA Project	10	11%
4	Modern Front-End Tools: GraphQL, Static Site Generation with Astro, and Final Capstone Project	18	20%

13. Academic Integrity Policy:

Education at Chitkara University builds on the principle that excellence requires freedom where Honesty and integrity are its prerequisites. Academic honesty in the advancement of knowledge requires that all students and Faculty respect the integrity of one another's work and recognize the importance of acknowledging and safeguarding intellectual property. Any breach of the same will be tantamount to severe academic penalties.

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(DD/MM/YYYY)	26/06/2025	

Annexure

1. Pre- requisite

Mention The Pre-requisite skill set or course/s if it is expected to be studies before this course, otherwise write “not applicable”.

2. NHEQF levels

The NHEQF levels represent a series of sequential stages expressed in terms of a range of learning outcomes against which typical qualifications are positioned/located. NHEQF level 4.5 represents learning outcomes appropriate to the first year (first two semesters) of the undergraduate programme of study, while Level 8 represents learning outcomes appropriate to the doctoral-level programme of study.

Table 1: Higher education qualifications at different levels on the NHEQF

NHEQF level	Examples of higher education qualifications located within each level
Level 4.5	Undergraduate Certificate. Programme duration: First year (first two semesters) of the undergraduate programme, followed by an exit 4-credit skills-enhancement course(s).
Level 5	Undergraduate Diploma. Programme duration: First two years (first four semesters) of the undergraduate programme, followed by an exit 4-credit skills-enhancement course(s) lasting two months.
Level 5.5	Bachelor's Degree. Programme duration: First three years (Six semesters) of the four-year undergraduate programme.
Level 6	Bachelor's Degree (Honours/ Honours with Research). Programme duration: Four years(eight semesters).

Level 6	Post-Graduate Diploma. Programme duration: One year (two semesters) for those who exit after successful completion of the first year (two semesters) of the 2-year master's programme.
Level 6.5	Master's degree. (e.g. M.A., M.Com., M.Sc., etc.) Programme duration: Two years (four semesters) after obtaining a 3- year Bachelor's degree (e.g. B.A., B.Sc., B.Com.etc.).
Level 6.5	Master's degree. (e.g. M.A., M.Com., M.Sc., etc.) Programme duration: One year (two semesters) after obtaining a 4- year Bachelor's degree (Honours/ Honours with Research) (e.g. B.A., B.Sc., B.Com. etc.).
Level 7	Master's degree.(e.g. M.E./M.Tech. etc.) Programme duration: Two years (four semesters) after obtaining a 4- year Bachelor's degree. (e.g. B.E./B.Tech. etc.)
Level 8	Doctoral Degree

3. NHEQF level descriptors

Each NHEQF level is structured based on the defined learning outcomes which lead to the expected graduate attributes/profile. The level descriptors reflect the expected outcomes of learning that should be achieved and demonstrated by graduates of a specific programme of study leading to a qualification at a specific NHEQF level.

Click [Learning outcomes descriptors for qualification for all levels on the NHEQF](#)

4. Course Outcomes

The number of Course Outcomes is recommended to be 4-5 for courses that do not contain practical component and 6 for those courses with a practical component. Flexibility can be sought by the post-graduate courses in this regard.

5. lab Plan

The following are the guidelines to be followed while creating plans

- Each session may be planned for a duration of 45/50mins (irrespective of the double hour or single hour scheduled in timetable).
- Every session must incorporate at least one active learning method which may or may not be part of the assessments.
- Put BoS Approved Syllabus in the topics. Deviations (if any) from BoS approved syllabus must be brought to the notice of BoS chairman & Dean Academics. After approval, revised handout should be submitted.
- The Topics elaborated in the Lab plan must match those in the course execution plan.

6. Teaching Learning Methods

The following are some of the Teaching & Learning methods that can be incorporated in session wise teaching learning plan.

• Teacher-centered Learning Methods:

- Lecture
- Discussion
- Demonstration method using a simulation or a tool
- Reviewing
- Questioning

• Learner-centered teaching & Learning methods:

- Active learning**, in which students solve problems, answer questions, formulate questions of their own, discuss, explain, debate, or brainstorm during class;
- Cooperative learning**, in which students work in teams on problems and projects under conditions that assure both positive interdependence and individual accountability; and
- Inductive teaching and learning**, in which students are first presented with challenges (questions or problems) and learn the course material in the context of addressing the challenges.
- Inductive methods** include inquiry-based learning, case based instruction, problem-based learning, project-based learning, discovery learning, and just-in-time teaching. It is important to integrate authentic, reflective and collaborative learning experiences when designing for student-centered learning.

7. Active Learning Methods

The following are some of the Active Learning Methods that can be incorporated in session wise teaching learning plan.

- One Minute Paper
- Group Discussion
- Student-Created PPT, Charts, Matrices, Flowcharts, Models
- The Fish Bowl
- Debate
- Video Synthesis
- Quiz/Test Questions
- Brain Storming Sessions
- Case Study
- Shadowing
- Leading Question
- Puzzle, Enigma, Contradiction
- Statement-Opinion-Summary
- Think / Pair / Share
- Peer Review
- Just in Time Teaching
- Statement-Opinion-Summary
- Peer Survey
- Focused Listing

- Role-Playing
- Student Field Work with Reflection
- Infusing Humor into Class Sessions
- Inviting Effective Guest Speakers

8. Remedial Classes

After every Sessional Test, identify weak learners, provide supplement course handout. Student list and Impact Observed report should be submitted to Dean through proper channel.

9. Self Learning

Plan 10% of topics in self-learning mode with discussions, ALM's and Assessment happening in the class.

10. Content Beyond Syllabus

Plan Advanced Topics, Experiments, Additional Reading, Research papers in self-learning mode with ALM's and Assessment happening in the regular class or lab. Usually caters advanced learners. Identify Advanced learners. For Extra classes, schedule should be notified accordingly.

11. Assessment Type

1. Assessment broadly can be classified into the following types:

- Diagnostic assessments:** Diagnostic assessments are intended to help teachers identify what students know and can do in different domains to support their students' learning. These help teachers determine strengths of students in various areas to better address their specific needs.
- Formative assessments:** Formative assessment refers to a wide variety of methods that teachers use to conduct in-process evaluations of student comprehension, learning needs, and academic progress during a lesson, unit, or a course. Formative assessments help teachers identify concepts that students are struggling to understand, skills they are having difficulty acquiring, or learning standards they have not yet achieved so that adjustments can be made to lessons, instructional techniques, and academic support.
- Summative assessments:** Summative assessment is an assessment administered at the end of an instructional unit in a course. These assessments are intended to evaluate student learning by comparing performance to a standard or benchmark.
- Ipsative assessments:** Ipsative assessment involves comparisons between past and current work to identify a learner's growth over time, rather than progress toward an external set of criteria. Therefore, Ipsative assessment is an internal or self-referenced assessment.
- Norm-referenced assessments:** Norm-referenced tests report whether test takers performed better or worse than a hypothetical average student, which is determined by comparing scores against the performance results of a statistically selected group of test takers, typically of the same age or grade level, who have already taken the exam.
- Criterion-referenced assessments:** Criterion-Reference tests measure the performance of test takers against the criteria covered in the curriculum.
- Peer-to-Peer randomised Assessments:** Peers will be able to provide assessment in this case
- Industry Validation of Effectiveness:** In the Vocation Education, Industry validation of effectiveness of training is particularly important.
- Self-assessments:** To evaluate how much the learner has grasped by self-learning.

2. Other Assessment Methods: Conducting an assessment takes time, thought, attention, planning, and often collaboration. Each assessment tool, whether a short survey or detailed rubric, will be useful only insofar as it both addresses the outcomes well and is feasible to use.

- Rubrics:** For assessing qualitative student work such as essays, projects, reports, or presentations. Rubrics serve well to clearly denote the specific expectations for an assignment, for collecting data for assessment of student learning outcomes, and for student performance. Rubrics can be used for grading, for providing feedback to students, and for informing and encouraging students to think about their own learning.
- Portfolios and E-Portfolio:** Portfolios can provide a window into the process of student learning across a semester-long project that can be assessed (usually by using a rubric).
- Curriculum Mapping:** A good curriculum map can serve to focus assessment, and the improvements that follow, where it will be most useful, informative, or effective.
- Structured Interviews:** While time-consuming, structured interviews are useful when specific questions need to be asked. It also leaves room for unplanned topics or ideas to emerge.
- Student Experience Surveys:** Student experience in research universities (SERU), including administration of on-line census SERU Undergraduate and Graduate Surveys, can yield important information about student perceptions and experiences.

12. Evaluation Component & Types

As per LMs we need to figure it out whether it is component 1, 2 or 3. In Types of Evaluation Component, we need to specify what type of evaluation we are performing like Continuous Evaluation or Sessional Test or End Term Examination.

13. No. of Assessments and Weightage of Components

Department will give guideline for number of assessments, mandatory or optional and weightage.