

# Employee Engagement and Learning Behavior

Major Project

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# 1 Project Overview

## 1.1.1 Brief introduction of the project.

The Employee Engagement and Learning Behavior project aims to enhance the way organizations track and analyze employee interactions with learning materials. In an era where continuous learning is paramount, this project is designed to create a comprehensive system that monitors various facets of employee engagement, including the amount of time spent on the learning platform, participation in discussion forums, and performance on quizzes. The insights gained from this data will empower organizations to tailor their training programs and foster a culture of continuous improvement.

The primary goals of the project include the development of an engagement dashboard that provides employees with a visual representation of their learning progress. This dashboard will not only foster motivation but will also encourage employees to take ownership of their learning journeys. Additionally, the project will focus on creating user-friendly administrative interfaces that allow managers and HR personnel to easily access and interpret engagement data. These interfaces will facilitate the identification of trends, enabling proactive measures to enhance employee participation and satisfaction.

To ensure a responsive learning environment, the project will implement feedback forms that allow employees to share their thoughts on the learning materials and their overall experience. This feedback will be instrumental in refining content and delivery methods. Lastly, a robust database will be designed to securely store all engagement data, ensuring that it is easily accessible for analysis and reporting. By integrating these elements, the Employee Engagement and Learning Behavior project aspires to create a dynamic system that not only tracks learning outcomes but also actively contributes to the professional development of employees..

# 2 Project Scope

## 2.1.1 Web app support

Platforms	Version
Google Chrome	97 and above
Microsoft Edge	97 and above

## 2.1.2 Key features and functionalities of the web app.

The web application should incorporate key features that cater to user needs and preferences. First and foremost, the user interface should prioritize simplicity and intuitiveness, enabling employees to navigate seamlessly through the platform, regardless of the device they are using. The layout must be responsive, ensuring that all elements are easily accessible on both desktop and mobile screens.

Additionally, the application should include essential functionalities such as real-time progress tracking, enabling employees to view their learning metrics at a glance. This can be complemented by personalized recommendations based on individual performance, fostering a more tailored learning experience. Incorporating interactive elements, such as discussion forums and feedback forms, will enhance user engagement by encouraging collaboration and communication among employees.

Moreover, the inclusion of notifications and reminders can help maintain user engagement by prompting employees to revisit learning materials or participate in upcoming discussions and quizzes. Integrating social features, such as the ability to share achievements or milestones, can further motivate users and create a sense of community.

By considering these key features and functionalities in the design of the web application, the project can effectively meet the immediate needs of users while laying the groundwork for a successful mobile experience in the future. This strategic approach ensures that the platform remains relevant and valuable in an increasingly mobile-centric world.

## 3 Architecture and Technology Stack

### 3.1.1 Overall architecture of the web application with Tech Stack.

The proposed web application for the Employee Engagement Project adopts a full-stack architecture that emphasizes performance, scalability, and developer productivity. The architecture comprises several key components, each chosen for its strengths in creating a robust, responsive, and user friendly system.

#### FRONT-END DEVELOPMENT WITH NEXT.JS

Next.js serves as the backbone of the front-end development. This React based framework is renowned for its server-side rendering capabilities, which enhance page load speeds and improve SEO. Its file-based routing system simplifies navigation and allows for the rapid development of features, making it ideal for a project that requires dynamic content updates and real time data presentation.

#### AUTHENTICATION VIA CLERK

For user authentication, Clerk is integrated into the application. This service provides a seamless login experience, ensuring that user data is secure and managed effectively. Clerk's ready-to-use components accelerate the implementation of authentication features, allowing developers to focus on delivering value-added functionalities rather than getting bogged down in the complexities of user management.

#### STYLING WITH TAILWIND CSS

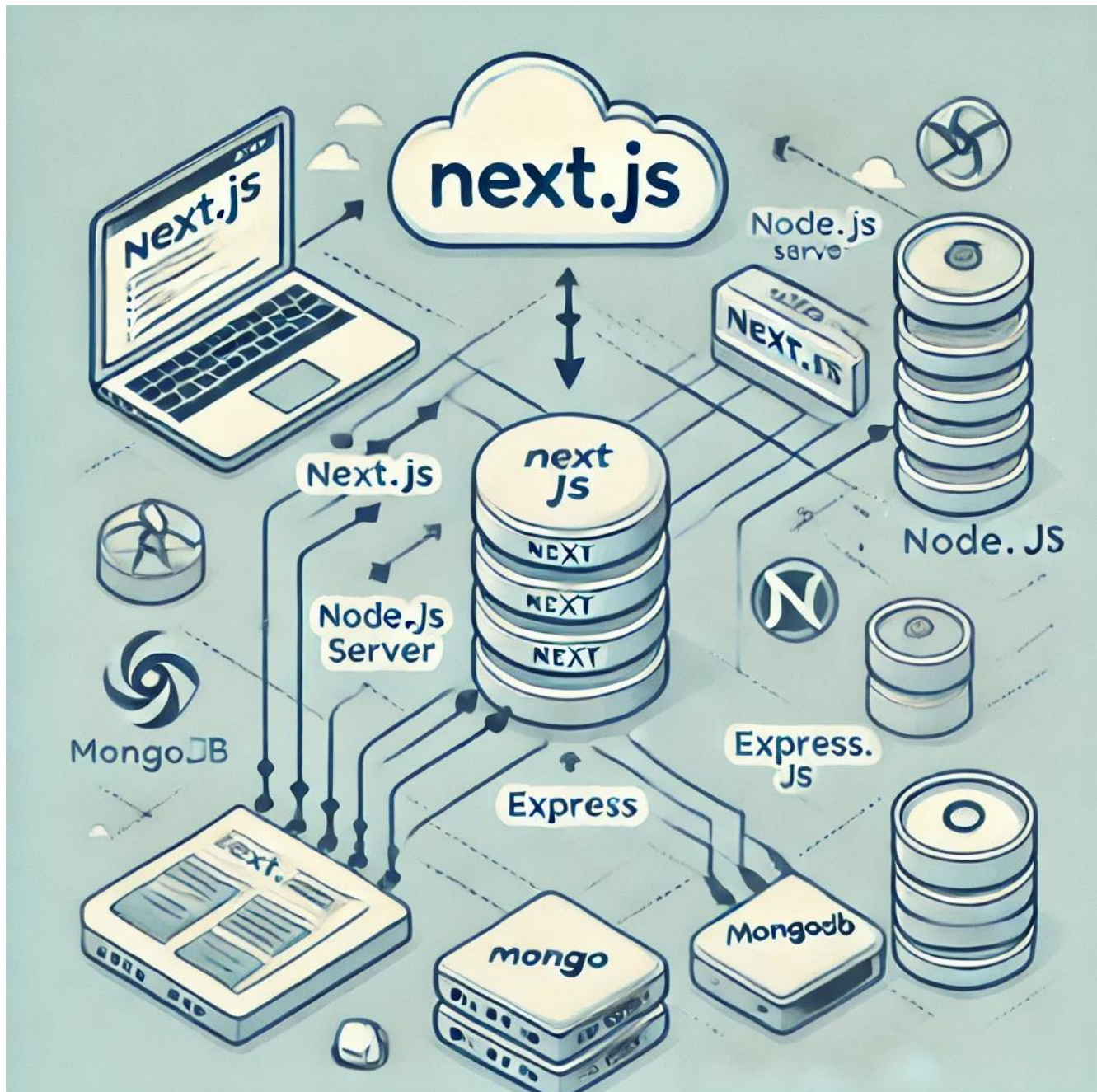
Tailwind CSS is utilized for styling the application, promoting a utility-first approach that enhances both design consistency and development speed. By enabling developers to construct responsive layouts directly in the markup, Tailwind CSS facilitates rapid prototyping and iteration. This results in a visually appealing user interface that adapts well to various screen sizes and devices.

#### UI COMPONENTS WITH SHADCN

To further enhance the user interface, Shadcn is employed for additional UI components. This library provides pre-built, customizable components that align well with Tailwind CSS, ensuring a cohesive design language throughout the application. Utilizing Shadcn allows developers to maintain high quality in UI design while expediting the development process.

#### DATA MANAGEMENT WITH PRISMA AND MONGODB

On the back end, Prisma is chosen as an Object-Relational Mapping (ORM) tool, simplifying database interactions and streamlining data management. It provides a type-safe API that enhances developer productivity and code reliability. Coupled with MongoDB, a NoSQL database, the application benefits from a flexible schema design that can efficiently handle the diverse data types associated with employee engagement metrics. This combination supports scalability as the application grows and the volume of data increases. In summary, this technology stack not only addresses the immediate requirements of the Employee Engagement Project but also positions it for future expansion and adaptation. By leveraging these modern tools, the architecture fosters an environment conducive to rapid development and a high-quality user experience.



### 3.1.3 Rationale behind the chosen technology stack.

In developing the Web Application Platform for Timesheet and Feedback System, we have chosen Next JS as the primary technology stack. The rationale behind this selection is based on the following considerations:

#### Cross-Platform Compatibility:

While Next js itself is primarily focused on building web applications, the React ecosystem provides various tools, frameworks, and libraries that enable developers to achieve cross-platform compatibility for their applications, extending the reach and usability of React applications across different platforms and devices.

#### Time and Cost Efficiency:

By utilizing Next JS, we can optimize development resources and streamline the development process. This efficiency enables faster time-to-market, ensuring the application reaches the organisation sooner.



## **Large Developer Community and Ecosystem:**

Next JS boasts a vast and active developer community. This thriving community provides extensive support, resources, and libraries that accelerate development and problem-solving. The availability of a wide range of open-source libraries and components allows us to leverage existing solutions and integrate additional functionalities efficiently.

## **Code Reusability:**

Next JS component-based architecture promotes code reusability. By developing reusable components, we can efficiently manage the application's UI elements and logic across different screens. This approach not only simplifies development but also facilitates maintenance and future updates, as changes made to shared components propagate throughout the application.

In developing the Data Engineering Pipeline for Timesheet and Feedback System, we have chosen Snowflake and Data Build Tool (dbt) as the primary technology stack. The rationale behind this selection is based on the following considerations:

## **Rich Ecosystem of Libraries:**

Python boasts a vast and robust ecosystem of libraries and frameworks specifically tailored for machine learning and data science, such as TensorFlow, PyTorch, scikit-learn, pandas, NumPy, and matplotlib. These libraries provide powerful tools for data manipulation, modelling, visualization, and evaluation, allowing developers to efficiently implement and experiment with ML algorithms.

Based on these considerations, we have chosen the above technology stack as our primary technology stack.

## **4 Web App Components**

### **4.1.1 Main components of the web app.**

The web application for the Employee Engagement Project comprises several essential components that work together to create a cohesive and efficient user experience. Each component plays a vital role in the functionality and overall effectiveness of the application.

#### **USER AUTHENTICATION**

User authentication is a fundamental component, ensuring that only authorized individuals can access the platform. The integration of Clerk provides a robust authentication system, allowing users to sign up, log in, and manage their profiles securely. This not only protects sensitive information but also enhances user trust in the platform. By implementing features like single sign-on (SSO) and multi-factor authentication (MFA), the application can further strengthen security while ensuring a seamless login experience.

#### **COURSE CATALOG MANAGEMENT**

The course catalog management system enables administrators to create, update, and organize educational content effectively. This component allows for the categorization of courses based on topics, skill levels, and other relevant criteria, making it easier for users to find and enroll in learning materials that align with their interests and professional development goals. A user-friendly interface for course management ensures that administrators can efficiently handle course offerings and maintain an up-to-date catalog.

#### **FEEDBACK COLLECTION SYSTEMS**

To foster continuous improvement, the application incorporates feedback collection systems that allow users to share their thoughts and experiences with the learning materials. This component includes feedback forms and surveys that can be easily accessed after course completion. The collected data is invaluable for identifying areas of improvement, enhancing content quality, and tailoring future offerings to meet user needs and preferences.

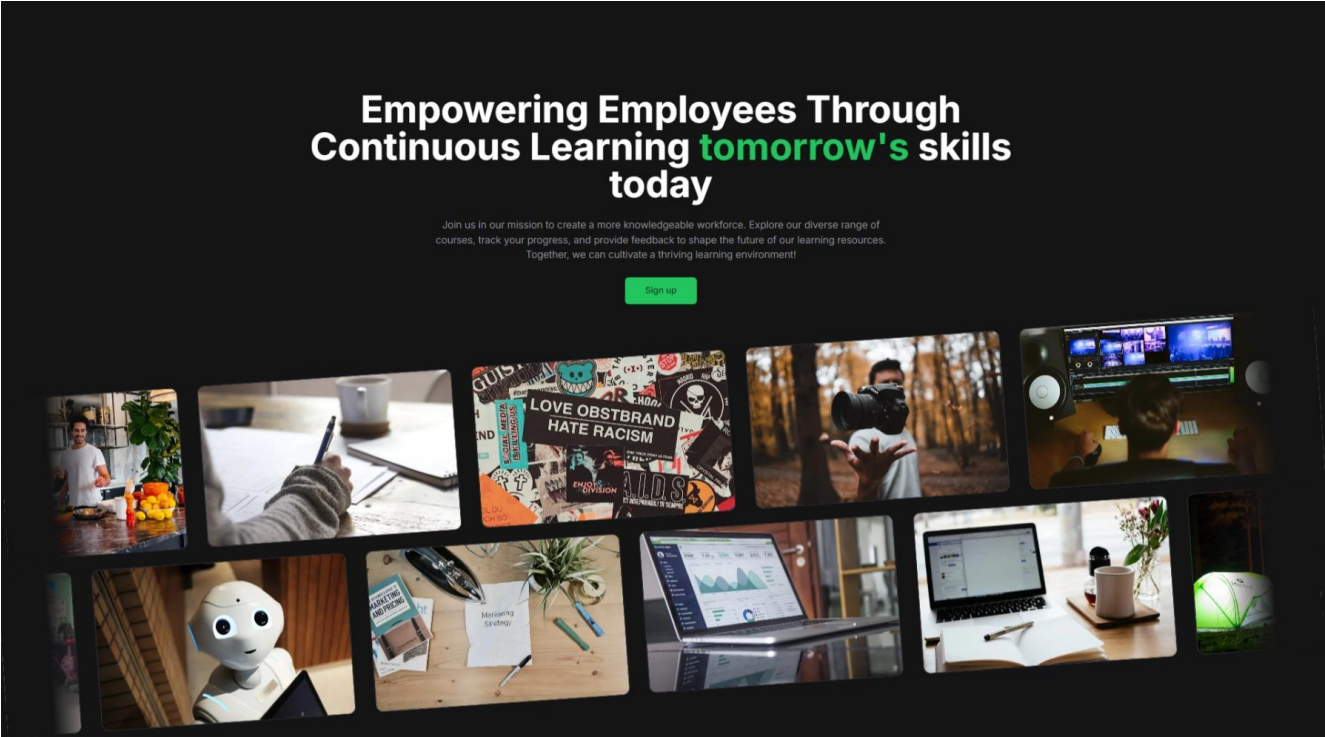
#### **USER ENGAGEMENT DASHBOARDS**

User engagement dashboards serve as a powerful tool for both employees and administrators. For users, the dashboard provides a visual representation of their learning progress, including metrics such as completed courses, quiz scores, and participation in discussions. This feature promotes self-motivation and accountability in the learning process. For administrators, the dashboard aggregates engagement data, enabling them to identify trends, measure the effectiveness of training programs, and make informed decisions to enhance employee engagement strategies. By integrating these components, the web application not only meets the immediate needs of users but also lays the groundwork for a dynamic and responsive learning environment that evolves with organizational goals.

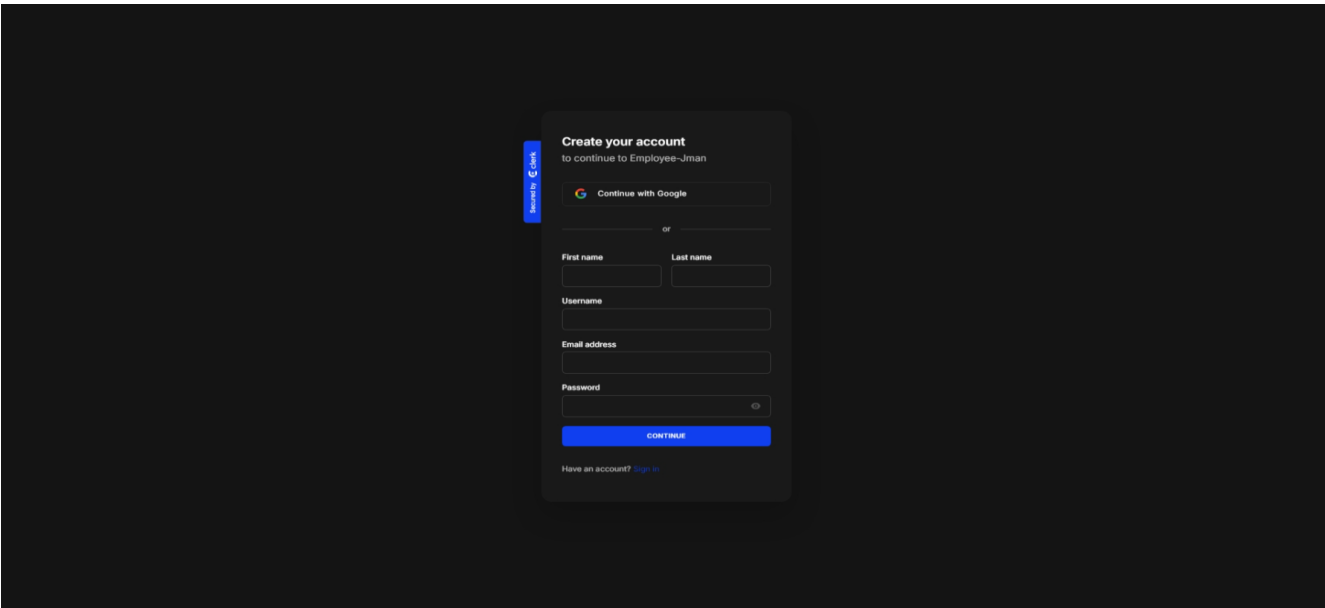
5 User Interface Design

5.1.1 User interface (UI)

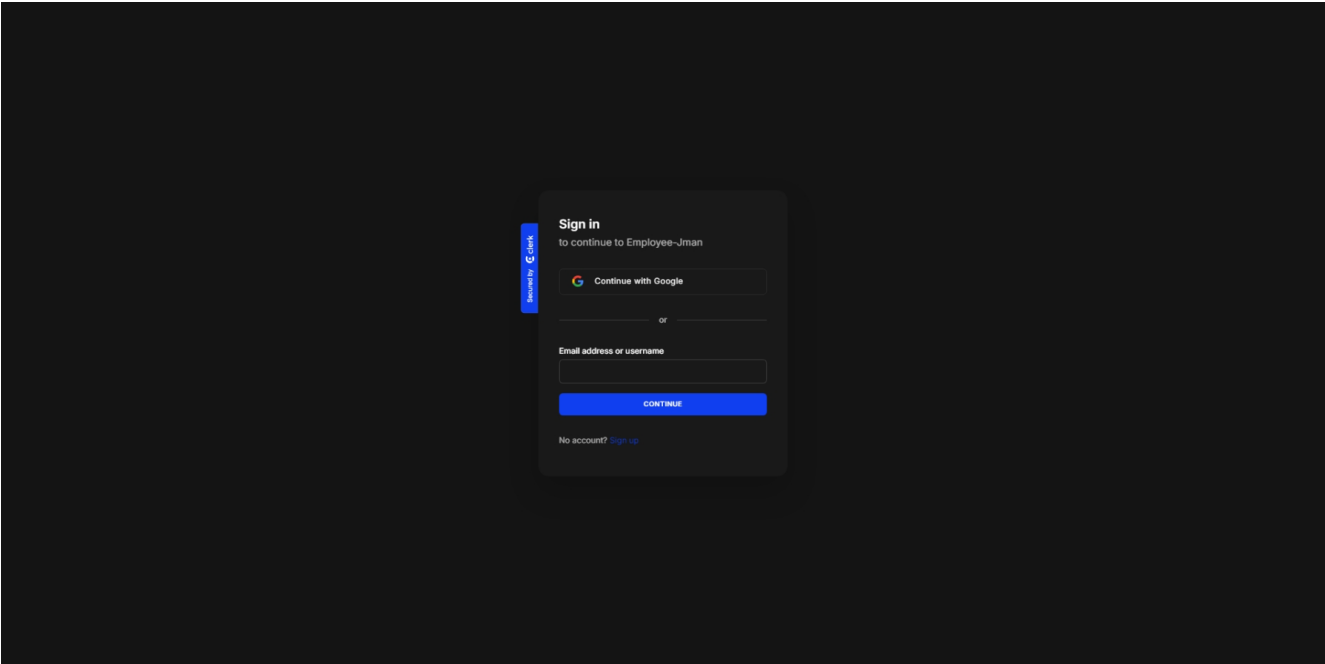
Landing Page Before Login



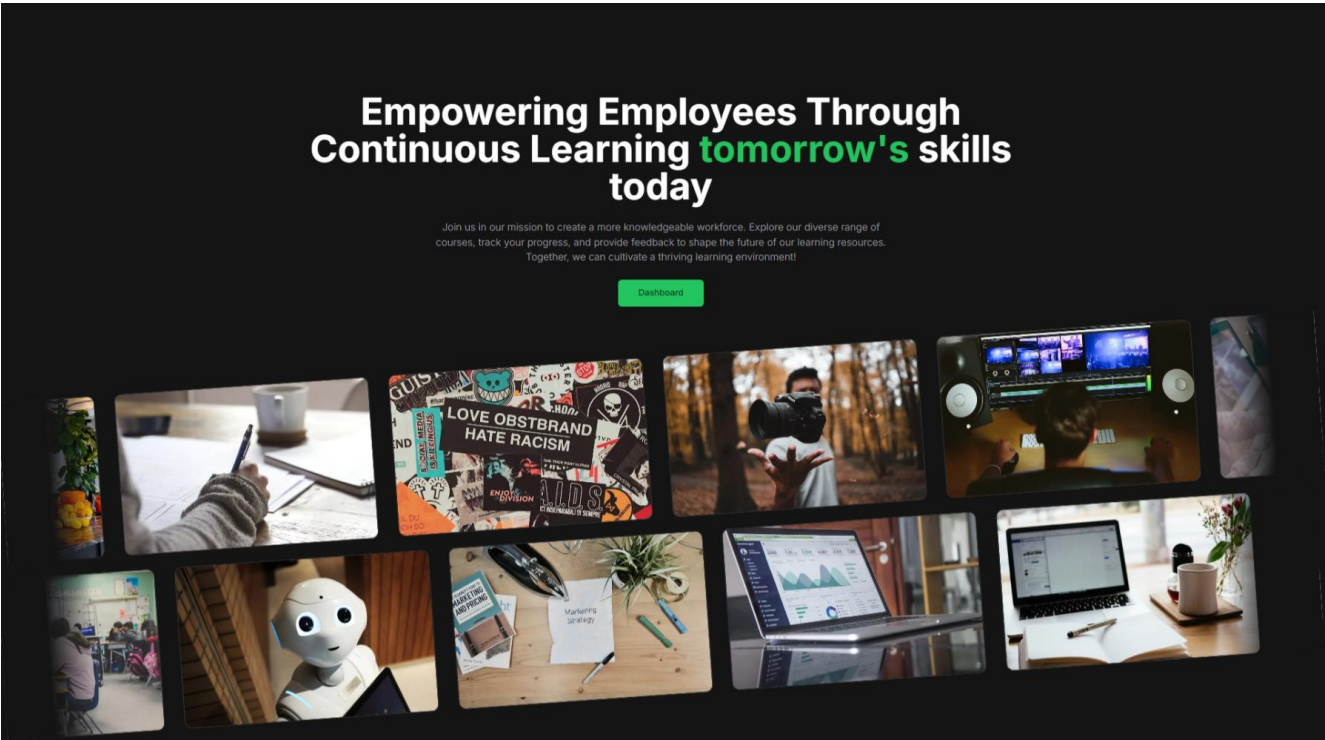
Register Page



Login Page

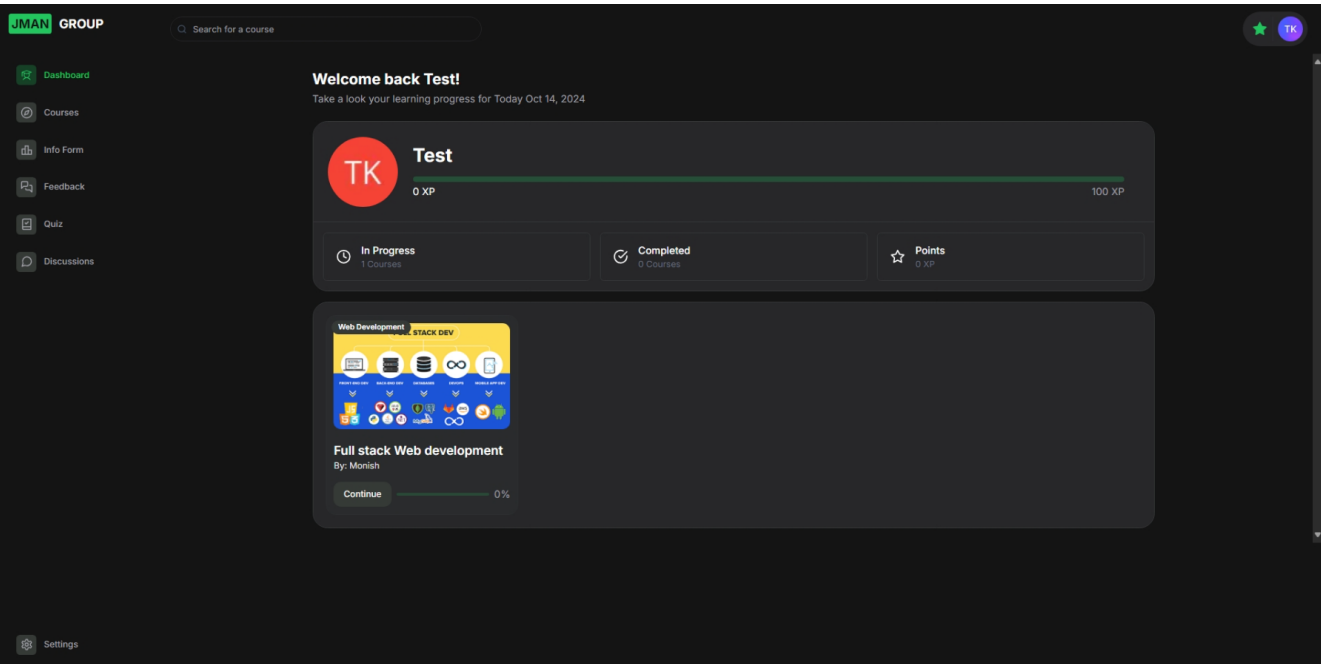


Landing Page After Login

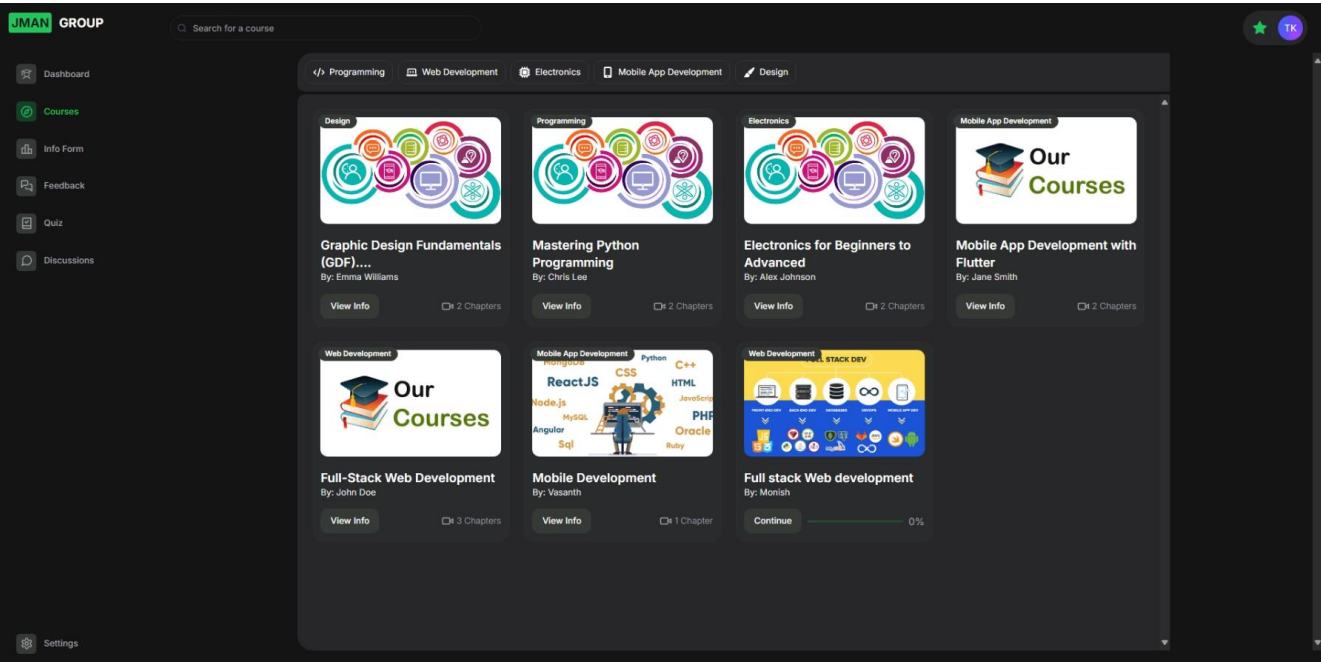




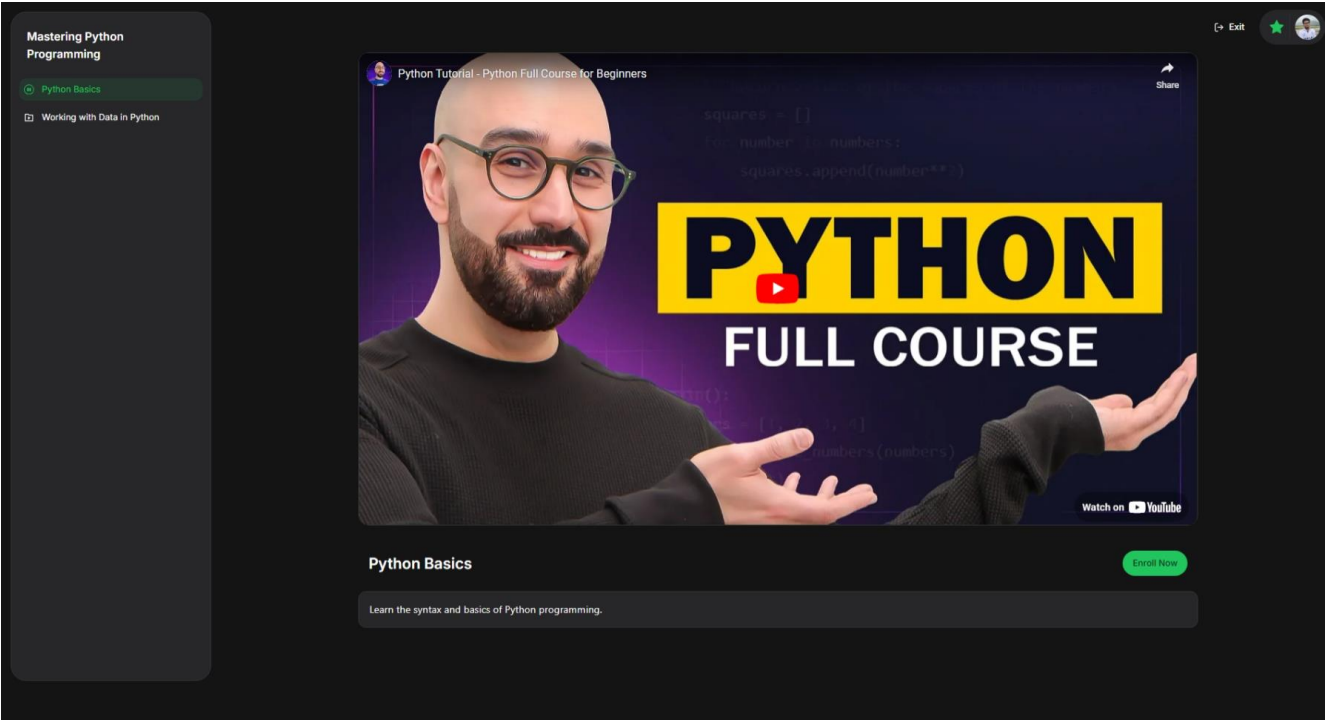
Employee Dashboard



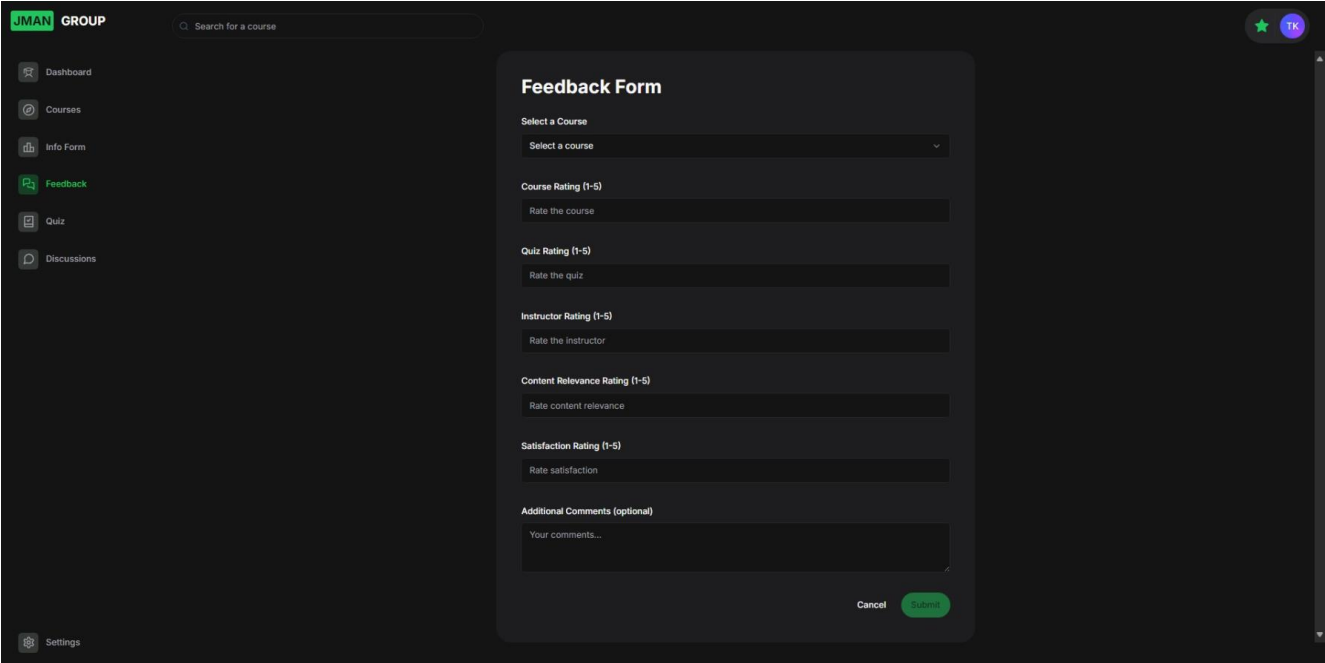
Employee Courses Page



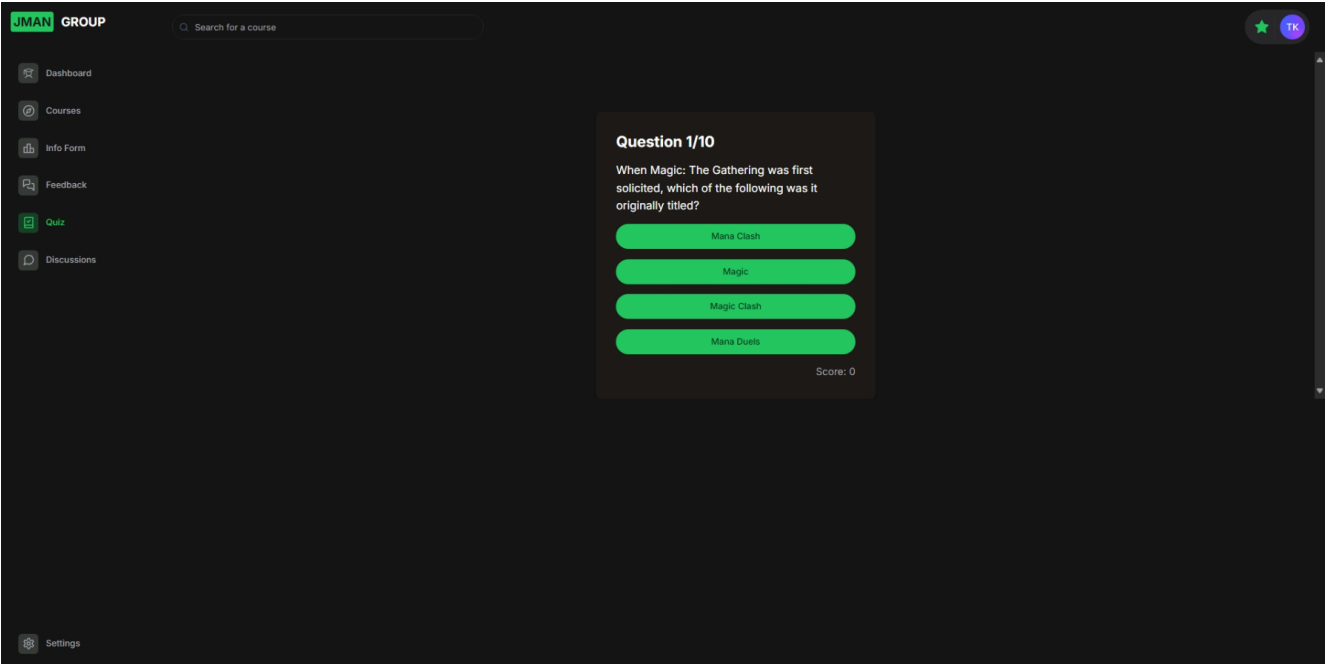
Individual Course Page



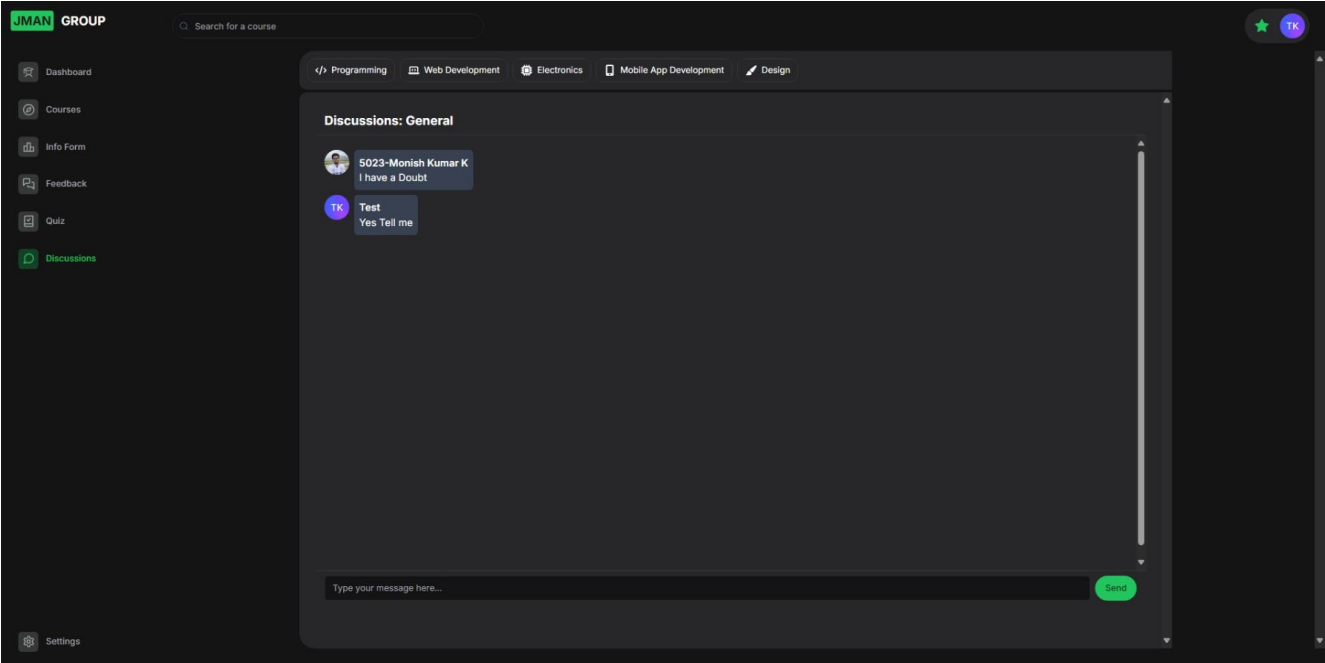
Employee Feedback Form For Courses



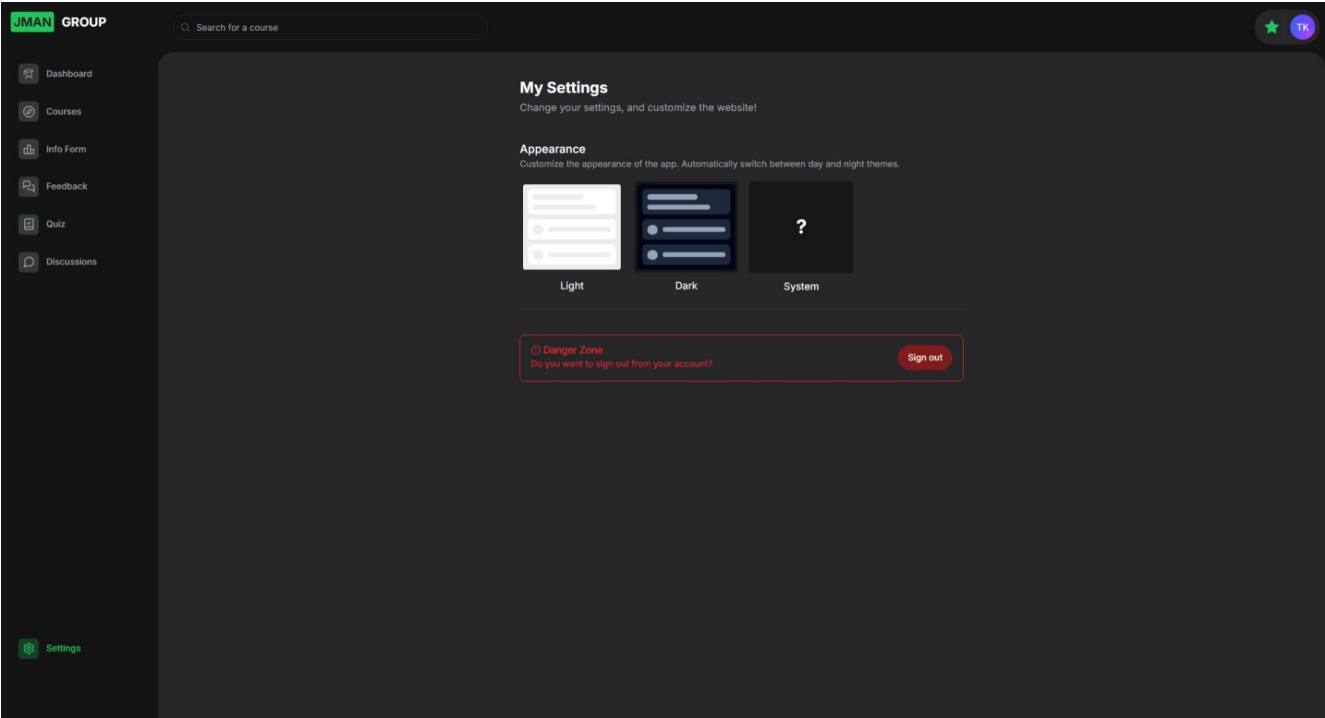
Quiz Module



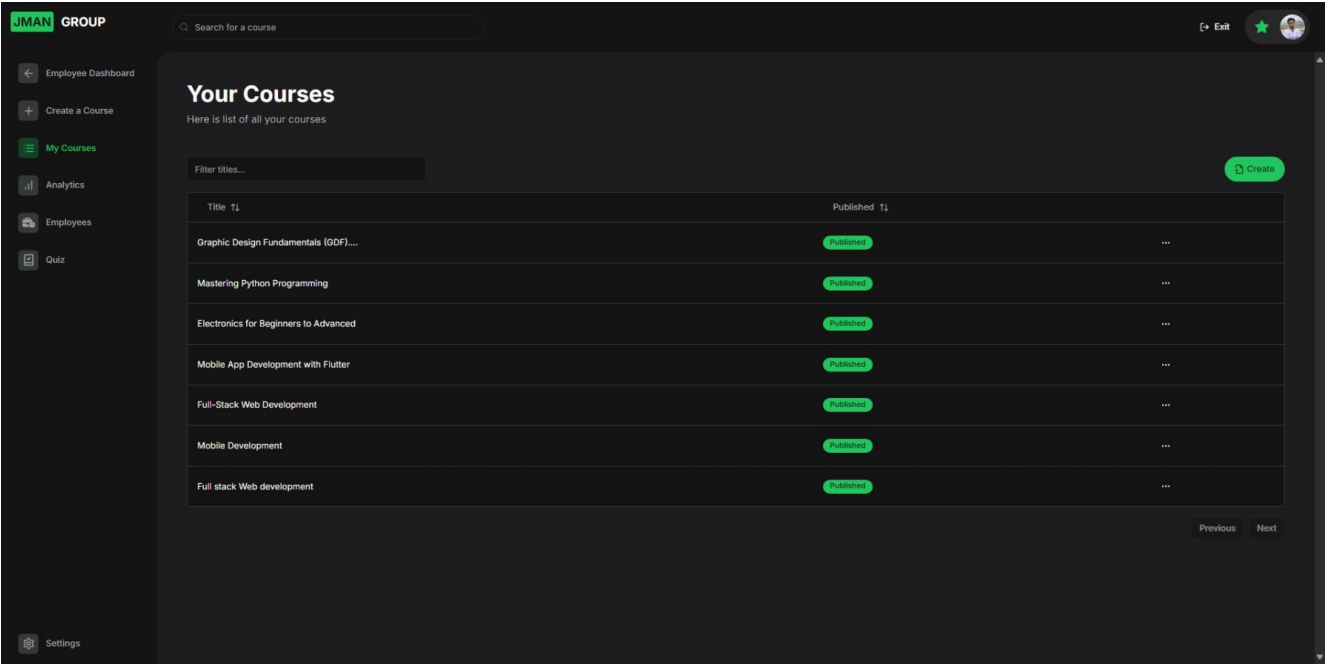
Discussion Module



Settings Page



Admin Courses Page



# Add Courses

JMANGROUP

Search for a course

Exit

Employee Dashboard

Create a Course

My Courses

Analytics

Employees

Quiz

Settings

Name your Course

What would you like to name your course? Don't worry, you can change this later.

Course Title

e.g. 'Advanced web development'

What will you teach in this course?

Author's Name

Abdurahman Nahhas

What is the name?

Cancel

Create Course

JMANGROUP

Search for a course

Exit

Employee Dashboard

Create a Course

My Courses

Analytics

Employees

Quiz

Settings

This course is not published. It will not be visible to the Employees.

Course Creation

Complete all fields (2/6)

Publish

Customize your course

Course Title & Admin

Data Engineering

By: Ritvik

Edit Text

Course Description

No description

Edit Text

Course Image

Add Image

Course Category

No category

Change

Course chapters

Course Chapter

Add a Chapter

No chapters

Drag and drop to reorder chapters

Sell your course

Course Price

No price

Edit Price

Circulation Limited: Client

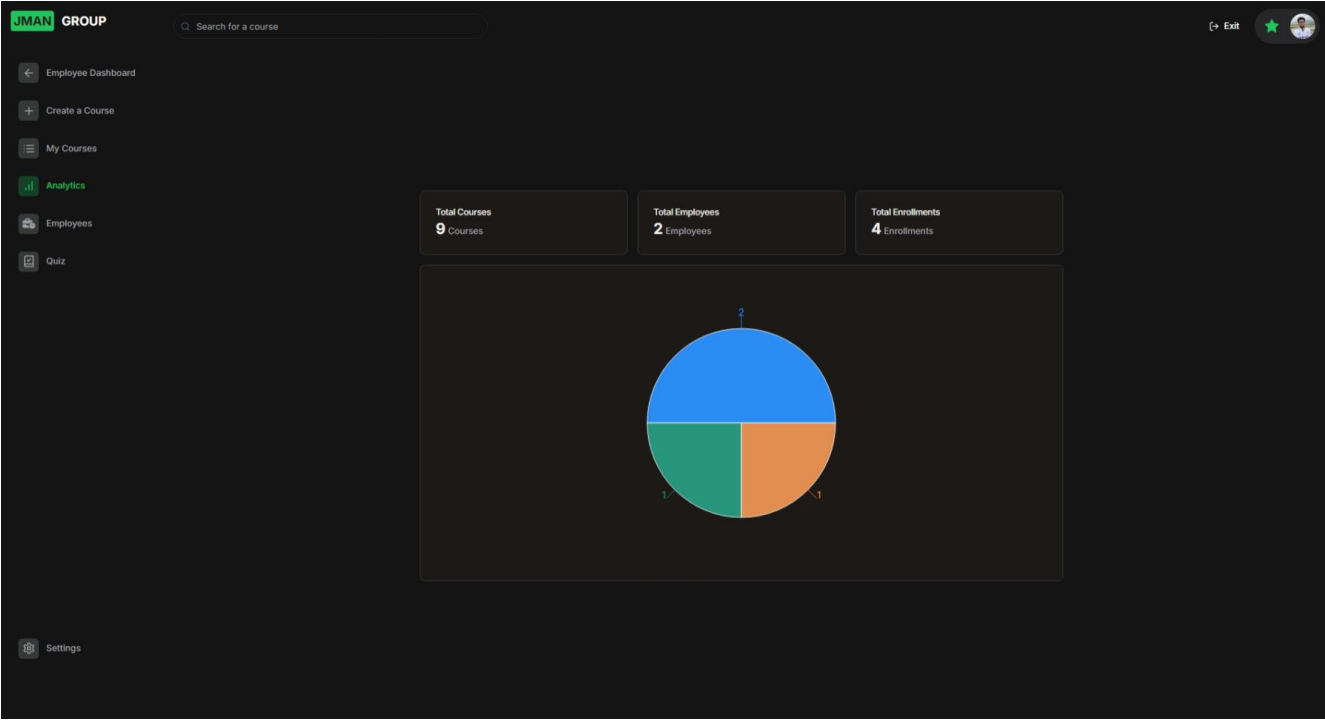
Version 1.0

Oct14

12



Analytics



Employees Display Page

The screenshot shows the 'Employees' section of the JMAN GROUP dashboard. The left sidebar is identical to the previous screenshot, with 'Employees' highlighted. The main content area is titled 'All Employees' and includes the subtitle 'Here is a list of all employees'. Below this is a table with four columns: Name, Email, Department, and Role. The table contains two rows of data. At the bottom right of the table, there are 'Previous' and 'Next' navigation buttons.

Name	Email	Department	Role
Monish Kumar K	monishkumark12@gmail.com	Full Stack	Software Engineer
Test k	monishk2512@gmail.com	Data Engineering	Solution Enabler

## Quiz Scores

Your Quizzes			
Here is a list of all your quizzes			
User Name <small>T1</small>	Score <small>T1</small>	Attempt <small>T1</small>	Date <small>T1</small>
5023-Monish Kumar K	3	1	10/4/2024

## 6 Work with Data

Data engineering is a critical aspect of the Employee Engagement Project, as it ensures the efficient collection, processing, and preparation of data for analysis. The primary processes involved in data engineering for this project include dataset creation, data cleaning, and data preparation, which are essential for generating valuable insights from user engagement metrics.

### 6.1.1 Dataset Creation With Faker.

To create a realistic dataset for testing and development, we can utilize the Faker library in Python. Faker allows for the easy generation of dummy data that mimics real-world information, making it an essential tool for data engineers.

### 6.1.2 Data Cleaning And Preparation.

Once the dataset is generated, the next step is to clean and prepare the data for analysis. The cleaning process typically involves several steps:

#### Handling Missing Values:

Identify and address any missing or null values in the dataset. This may involve filling in missing data with averages, medians, or other appropriate values, or removing records with missing data if they are not significant.

#### Data Type Conversion:

Ensure that each column in the dataset is of the correct data type. For example, converting time spent from a string to a float or ensuring that quiz scores are integers.

#### Removing Duplicates:

Check for and eliminate any duplicate records to maintain data integrity.

### Normalization:

Standardize data formats, such as ensuring that all email addresses are in lowercase or that names follow a consistent format.

### Outlier Detection:

Identify and handle outliers that may skew analysis results. This could involve removing or adjusting extreme values. By following these steps, the dataset will be refined and ready for analysis, enabling stakeholders to derive meaningful insights from employee engagement data effectively.

## 7 Approach For Data Science

The analysis of employee engagement and learning behavior data through data science techniques requires a structured approach, focusing on feature engineering, model training, and evaluation metrics. Each of these elements plays a crucial role in ensuring that the insights derived from the data are actionable and relevant.

### 7.1.1 Feature Engineering.

Feature engineering is the process of transforming raw data into a format that is suitable for machine learning models. In the context of employee engagement data, various features can be derived from raw metrics. For instance, the time spent on learning platforms can be broken down into different categories such as 'average time per session' and 'total time spent per week'. Additionally, engagement metrics like course completion rates and quiz scores can be aggregated to create a composite score representing overall engagement. Other potential features include participation in discussion forums, frequency of feedback submissions, and time of day when learning occurs. These engineered features can provide a more nuanced view of employee behaviours and engagement levels.

### 7.1.2 Model Training With Random Forest.

Once the dataset has been prepared and the features engineered, the next step is model training. The Random Forest algorithm is particularly well suited for this task due to its ensemble learning approach, which builds multiple decision trees and merges their results for improved accuracy. It handles both classification and regression tasks effectively, making it a versatile choice for predicting outcomes such as employee satisfaction or likelihood of course completion based on engagement metrics. During training, the model should be validated using techniques such as cross validation to avoid overfitting and ensure that the model generalizes well to unseen data.

### 7.1.3 Evaluation Metrics.

To assess the performance of the Random Forest model, several evaluation metrics should be utilized. For classification tasks, metrics like accuracy, precision, recall, and F1-score can provide insights into the model's ability to predict employee engagement outcomes correctly. For regression tasks, metrics such as Mean Absolute Error (MAE) and Root Mean Square Error (RMSE) can be employed to evaluate the model's predictive accuracy. Additionally, confusion matrices can offer a visual representation of the model's performance across different classes. By carefully selecting and analyzing these metrics, organizations can gain confidence in the reliability of their predictive insights, informing strategies for enhancing employee engagement and learning effectiveness.

	Precision	Recall	F1-score
0	1.00	0.56	0.72
1	0.29	1.00	0.44
Accuracy			62.36%

## 8 Project Resources

### 8.1.1 Roles and responsibilities of the project team members.

Monish Kumar K - developing the full stack application, data engineering and data science.