SRM
INSTITUTE OF SCIENCE AND TECHNOLOGY
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DELHI-NCR CAMPUS, GHAZIABAD (U.P)

Learning Experience Platform - Becodemy

AR/VR-BASED REAL-TIME LEARNING EXPERIENCE PLATFORM

CSBS SEC-A

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Purpose of Software & Target Users

The purpose of Becodemy is to:

- Deliver engaging and interactive learning experiences using AR/VR.
- Provide a structured course system for skill development.
- Support real-time collaboration between learners and instructors.
- Offer seamless access across multiple devices.

Target Users:

- Students & Learners: Individuals looking to gain skills in an immersive way.
- Educational Institutions: Schools and universities adopting AR/VR learning.
- Corporate Trainers: Companies using Becodemy for employee training.
- Content Creators: Educators developing interactive learning modules.

Functional Requirements

1. User Authentication

- Users can register and log in using email or social accounts.
- Multi-factor authentication (MFA) is supported for security.
- Password reset and account recovery features.

2. Course Management

- Structured learning paths with interactive modules.
- AR/VR content integration for immersive learning.
- Video lectures, quizzes, and assessments.
- Real-time collaboration features (live classes, discussions).

3. Learning Experience & AR/VR Features

- AR-based interactive lessons (e.g., scanning objects for real-world examples).
- VR-based simulated environments for hands-on learning.
- AI-powered feedback on user progress.

4. Payment & Subscription System

- In-app purchases for premium courses via Stripe, Google Play, Apple Store.
- Subscription plans for different user levels.

5. Notification & Engagement

- Push notifications via FCM or OneSignal for course updates and reminders.
- Gamification with badges and leaderboards to encourage engagement.

Non-Functional Requirements

1. Performance

- Optimized for low-latency real-time interactions.
- Supports high-quality AR/VR rendering with smooth performance.

2. Availability

- Cloud-based infrastructure ensures 99.9% uptime.
- Auto-scaling support for high user traffic.

2. Security

- User data encryption and secure authentication with Firebase.
- Strict access control for content creators and learners.

UI Requirements

- Intuitive and responsive interface designed for mobile and tablet users.
- Dark/light mode for user comfort.
- VR-friendly UI for seamless navigation in virtual environments.

System Requirements

1. Frontend

- React Native with Expo for cross-platform mobile development.
- React Navigation for handling app navigation.

2. AR/VR Integration

- ARCore (Android) & ARKit (iOS) for AR experiences.
- Three.js or Unity for VR-based modules.

4. Analytics

- Google Analytics / Firebase Analytics for tracking user progress and engagement.

2. Backend

- Node.js with Express for handling API requests.
- Firebase for authentication and real-time database management.

3. Database & Storage

- Firestore for real-time data storage.
- Firebase Storage for course media and AR/VR content.

Constraints & Assumptions

1. Constraints

- AR/VR features require devices with supported hardware.
- High-speed internet connection is needed for seamless real-time interactions.

2. Assumptions

- Users have basic familiarity with AR/VR interactions.
- Institutions and businesses will integrate Becodemy as part of their digital learning solutions.

Acceptance Criteria

Becodemy will be considered complete when:

- All AR/VR functionalities are implemented and tested.
- The platform supports secure user authentication and content management.
- Payment and subscription features are fully functional.
- The system passes user acceptance testing (UAT) with no critical issues.

Project Team Roles & Responsibilities

1. **Tejas Rathi - Full Stack Developer**

- Develop both frontend (React Native) and backend (Node.js, Firebase).
- Implement AR/VR functionalities using ARCore, ARKit, and Three.js/Unity.
- Ensure seamless integration between UI, backend, and database.
- Optimize performance for real-time interactions.

2. **Harsh - UI/UX Designer**

- Design intuitive and responsive user interfaces for mobile & VR.
- Create wireframes, prototypes, and final UI elements.
- Ensure smooth navigation and accessibility in AR/VR environments.
- Implement dark/light mode and other usability features.

Project Team Roles & Responsibilities

3. **Vinayak - DevOps Engineer**

- Set up and manage cloud infrastructure for deployment.
- Ensure high availability (99.9% uptime) and auto-scaling.
- Implement CI/CD pipelines for seamless updates.
- Monitor system performance and security.

Effort Estimation using COCOMO Model

The Semi-Detached model is suitable for projects of intermediate complexity, such as Becodemy, which involves mobile AR/VR integration and cloud-based infrastructure.

Basic COCOMO Model:

The effort estimation formula for the Basic COCOMO Model is:

$$E = a \times (\mathrm{KLOC})^b \quad \Longrightarrow \quad E = 2.4 \times (KLOC)^{1.05}$$

where,

- E = Effort (Person-Months)
- $KLOC$ = 20 (assuming 20,000 lines of code)
- a,b = Model-specific constants

For the organic model: a = 2.4, b = 1.05

$E = 55.76$ **person-months (approx)**

Project Time Estimation

Time Estimation formula:

$$T = 2.5 \times (KLOC)^{0.38} \longrightarrow T = 2.5 \times (20)^{0.38}$$

where,

- ***T*** = Development time in months
- ***KLOC*** = 20 (assuming 20,000 lines of code)
- ***2.5*** = Coefficient for organic mode
- ***0.38*** = Exponent for organic mode

T = 11.81 **months (1 year approx)**

Project Cost Estimation

Project Cost Estimation formula:

$$\text{Total Cost} = \text{Effort (Person-Months)} \times \text{Cost per Developer per Month} \longrightarrow 55.76 \times 10,000$$

Total Cost = 1,672,800 INR (or 16.73 lakh INR)

So, the **estimated project cost is around ₹16.73 lakh** based on the given assumptions.

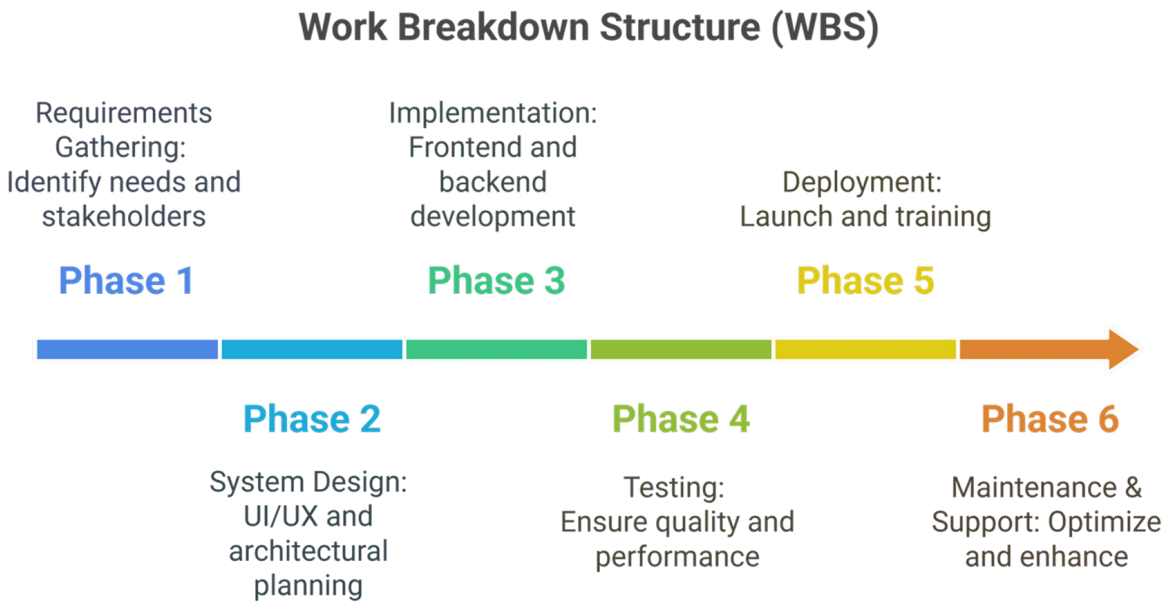
Cost Breakdown

Team Member	Effort (Person-Months)	Cost
Tejas Rathi	21 PM	₹2,08,000
Vinayak Parashar	18 PM	₹1,82,000
Harsh	13 PM	₹1,30,000
Total	**52 PM**	**₹5,20,000**

Phase	Effort (PM)	Total Cost(PM)
Requirement Analysis	6	1,80,000
System Design	8	2,40,000
Development	25	7,50,000
Testing	10	3,00,000
Deployment	5	1,50,000
Maintenance	1.76	52,800
Total Effort (PM)	**55.76**	**16,72,800**

Work Breakdown Structure (WBS)

The Becodemy Learning Experience Platform is designed to revolutionize digital learning by integrating AR (Augmented Reality) and VR (Virtual Reality) to create immersive educational experiences. This platform will enable interactive, engaging, and personalized learning, catering to different educational needs, including corporate training, academic learning, and skill development.



Work Breakdown Structure (WBS)

1. **Requirement Analysis**
   - Define project scope, objectives, and key stakeholders.
   - Gather business, functional, and technical requirements.
   - Identify core features for AR/VR-based learning.
   - Prepare Software Requirements Specification (SRS).

2. **System Design**
   - Create UI/UX wireframes and navigation flow.
   - Design system architecture (frontend, backend, database).
   - Define API structure and cloud deployment strategy.
   - Plan AR/VR content integration and interactions.

3. **Development**
   - Frontend: Develop UI using React Native with responsive components.
   - Backend: Build APIs using Node.js and integrate MongoDB for data management.
   - AR/VR: Implement interactive AR quizzes and VR-based learning modules.
   - Integrate authentication, payments, and real-time collaboration features.

Work Breakdown Structure (WBS)

4. **Testing**
   - Perform unit and integration testing for frontend, backend, and AR/VR.
   - Conduct security testing for authentication and data protection.
   - Optimize platform performance for smooth user experience.
   - Validate cross-platform compatibility (Web, iOS, Android).

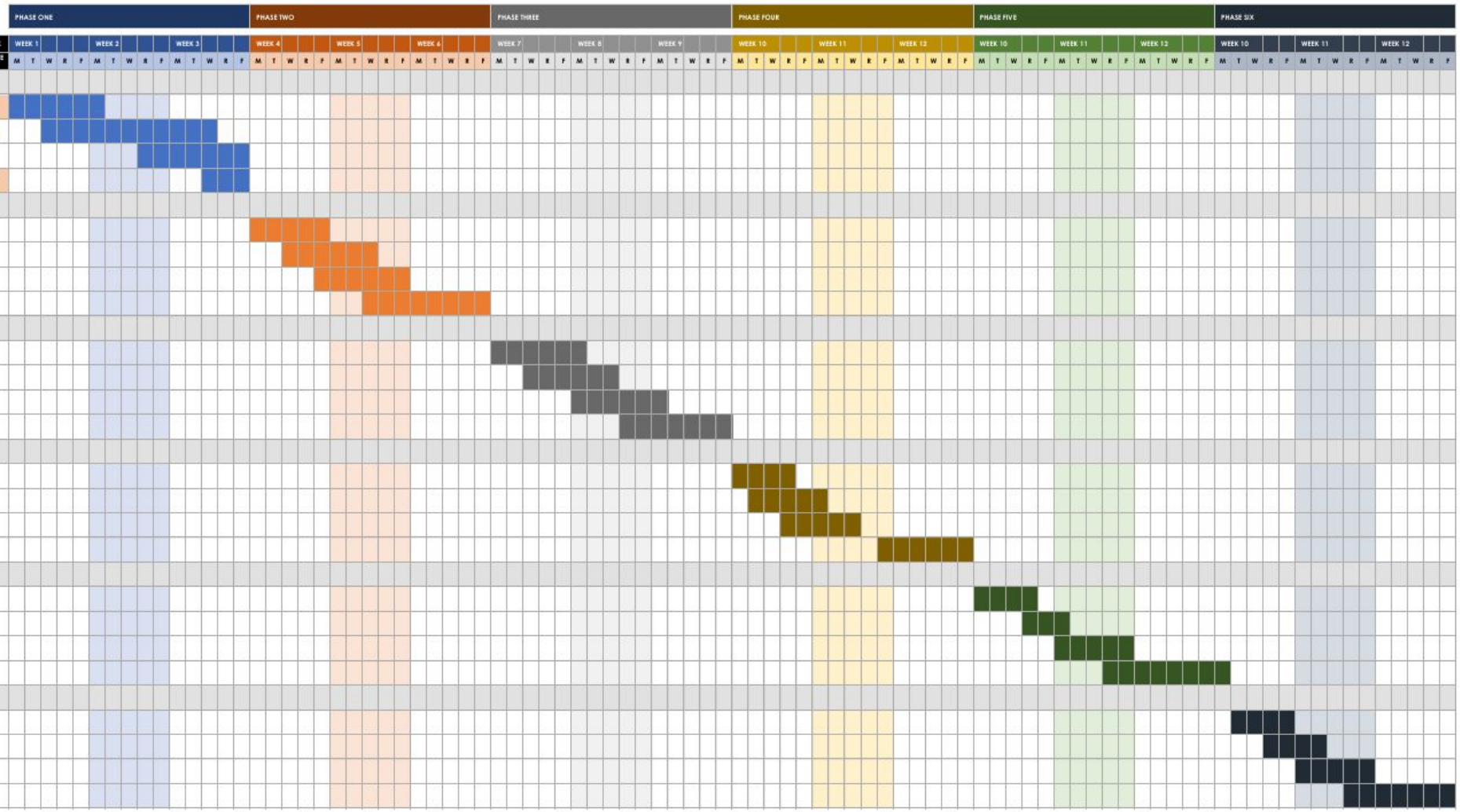
5. **Deployment**
   - Set up cloud infrastructure (AWS/GCP) for hosting and storage.
   - Configure CI/CD pipelines for automated deployment.
   - Release web and mobile apps on Google Play & App Store.
   - Conduct user acceptance testing (UAT) before full launch.

6. **Maintenance and Support**
   - Monitor system performance and fix bugs.
   - Provide security updates and patches.
   - Gather user feedback and improve features.
   - Scale cloud infrastructure based on user demand.

WORK BREAKDOWN STRUCTURE WITH GANTT CHART TEMPLATE

PROJECT TITLE	SkillSpace
PROJECT MANAGER	Tejas Rathi
COMPANY NAME	SIMSET, Madinagar
DATE	3/23/2025

WBS NUMBER	TASK TITLE	TASK OWNER	START DATE	DUE DATE	DURATION	% of TASK COMPLETE
1	Requirement Analysis					
1.1	Define project scope, objectives, and key stakeholders	Vinayak Parashar	2/1/2025	2/10/2025	9	100%
1.2	Gather business, functional, and technical requirements	Vinayak Parashar	2/5/2025	3/18/2025	41	80%
1.3	Identify core features for AR/VR-based learning	Tejas Rathi	3/10/2025	3/28/2025	18	60%
1.4	Prepare Software Requirements Specification (SRS)	Harsh	3/20/2025	4/10/2025	21	100%
2	System Design					
2.1	Create UI/UX wireframes and navigation flow	Harsh	3/10/2025	3/28/2025	18	60%
2.2	Design system architecture (frontend, backend, database)	Vinayak Parashar	3/15/2025	4/5/2025	21	60%
2.3	Define API structure and cloud deployment strategy	Tejas Rathi	3/25/2025	4/15/2025	21	0%
2.4	Plan AR/VR content integration and interactions	Tejas Rathi	4/10/2025	4/30/2025	20	0%
3	Development					
3.1	Develop frontend UI using React Native	Harsh	5/1/2025	6/30/2025	60	0%
3.2	Build backend APIs using Node.js and integrate firestore	Tejas Rathi	5/15/2025	7/20/2025	66	0%
3.3	Implement AR/VR features using ARCore, ARKit, Three.js/Unity	Tejas Rathi	6/10/2025	8/30/2025	81	0%
3.4	Integrate authentication, payments, and collaboration tools	Tejas Rathi	7/15/2025	9/30/2025	77	0%
4	Testing					
4.1	Project ObjectivesPerform unit and integration testing	Vinayak Parashar	10/1/2025	10/20/2025	19	0%
4.2	Conduct security testing for authentication & data protection	Vinayak Parashar	10/5/2025	10/30/2025	25	0%
4.3	Optimize platform performance for smooth experience	Harsh	10/10/2025	11/5/2025	26	0%
4.4	Validate cross-platform compatibility (Web, iOS, Android)	Harsh	11/10/2025	11/30/2025	20	0%
5	Deployment					
5.1	Set up cloud infrastructure for hosting	Tejas Rathi	12/1/2025	12/5/2025	4	0%
5.2	Configure CI/CD pipelines for automated deployment	Vinayak Parashar	12/5/2025	12/10/2025	5	0%
5.3	Release apps on Google Play & App Store	Vinayak Parashar	12/10/2025	12/20/2025	10	0%
5.4	Conduct user acceptance testing (UAT)	Harsh	12/15/2025	12/31/2025	16	0%
6	Maintenance and Support					
6.1	Monitor system performance and fix bugs	Harsh	1/1/2026	1/10/2026	9	0%
6.2	Provide security updates and patches	Tejas Rathi	1/5/2026	1/15/2026	10	0%
6.3	Gather user feedback and improve features	Harsh	1/10/2026	1/20/2026	10	0%
6.4	Scale cloud infrastructure based on demand	Vinayak Parashar	1/15/2026	1/31/2026	16	0%



System Architecture

Client Layer (Frontend – Mobile App)

- **Technologies**: React Native with Expo, ARCore (Android), ARKit (iOS), Unity or Three.js.
- **User Interaction Flow**: Overview of app navigation using React Navigation.
- **AR/VR Integration**: Integration with AR/VR technologies.
- **Local Storage Management**: Handling of user preferences and cache.

Backend Layer (API & Logic)

- **API Structure**: Node.js with Express for REST APIs.
- **Authentication**: Firebase Authentication with Multi-Factor Authentication (MFA).
- **Payment Processing**: Stripe, Google Play, Apple Store integration.

Cloud Services

- **Database**: Firestore for real-time database interactions.
- **Media Storage**: Firebase Storage for course media and AR/VR content.
- **Push Notifications**: FCM or OneSignal.

AR/VR Content Pipeline

- **CMS**: Web dashboard for course creators.
- **Content Builder**: Unity/Three.js tools for content creation.
- **Content Management**: Upload and management of AR/VR modules.

Security

- **Protocols**: OAuth2.0, MFA.
- **Access Control**: Role-Based Access Control (RBAC).
- **Data Encryption**: Encryption at rest and in transit.

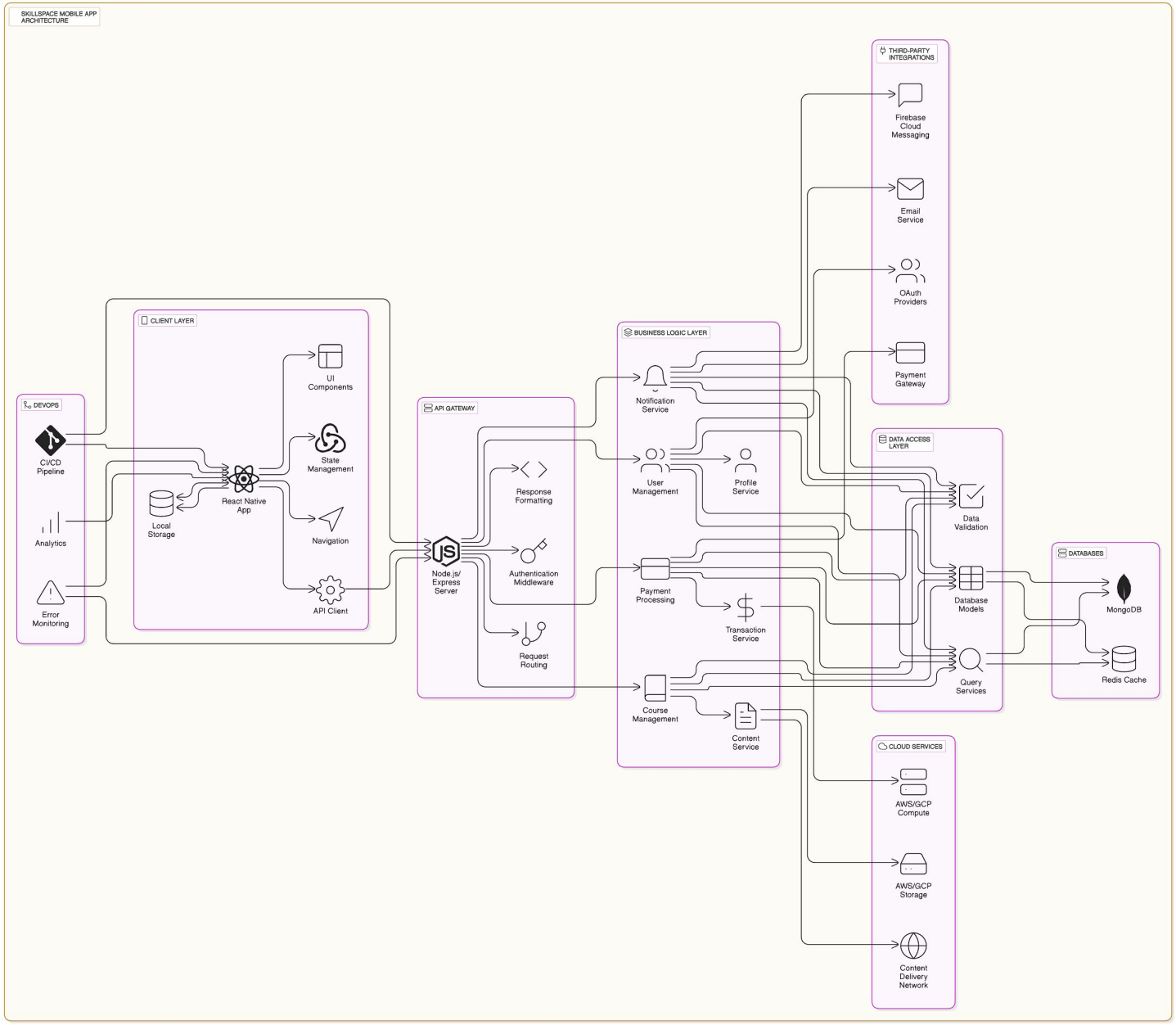
Analytics & Monitoring

- **User Tracking**: Firebase Analytics for user progress.
- **Crash Reporting**: Crashlytics for app crash data.
- **Performance Monitoring**: Backend performance oversight.

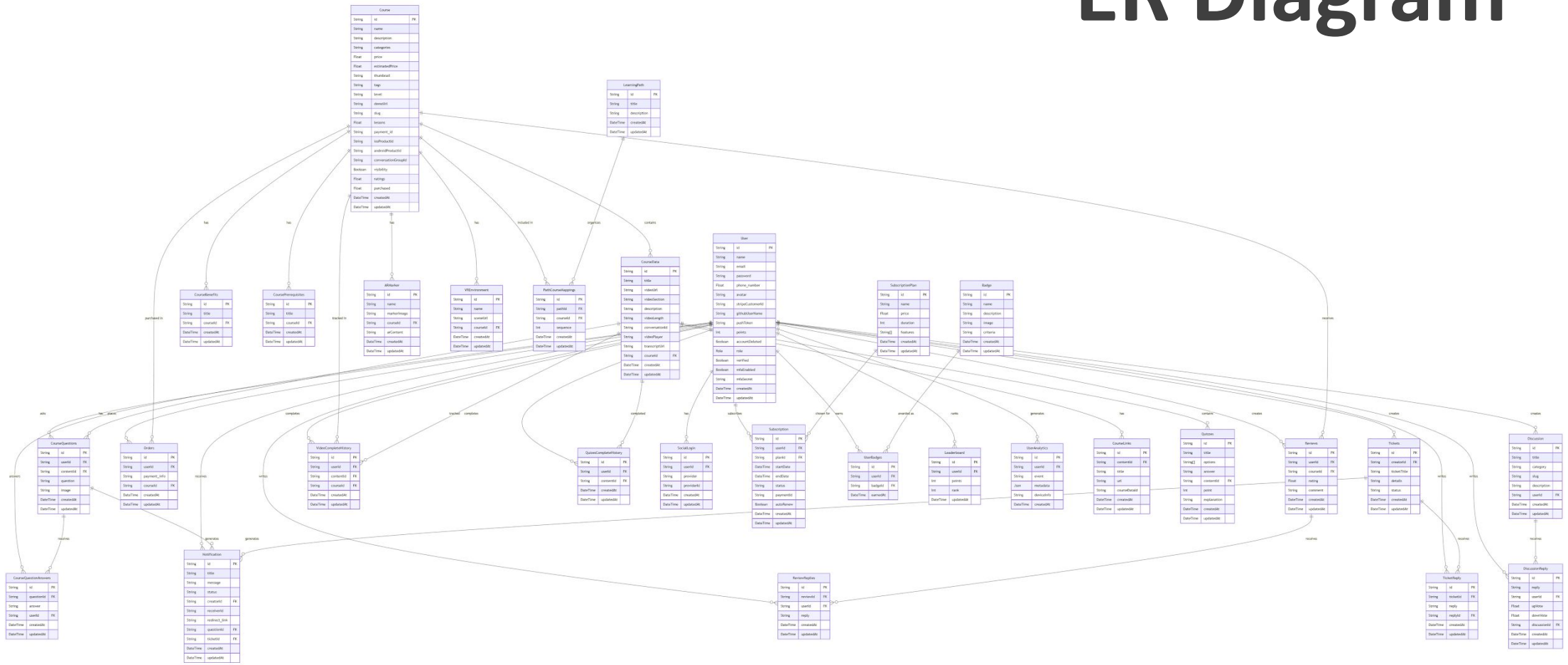
Deployment & Scaling

- **Hosting**: Cloud hosting on Firebase.
- **Auto-Scaling**: Configuration for scalable backend services.
- **CDN**: Content Delivery Network for asset delivery optimization.

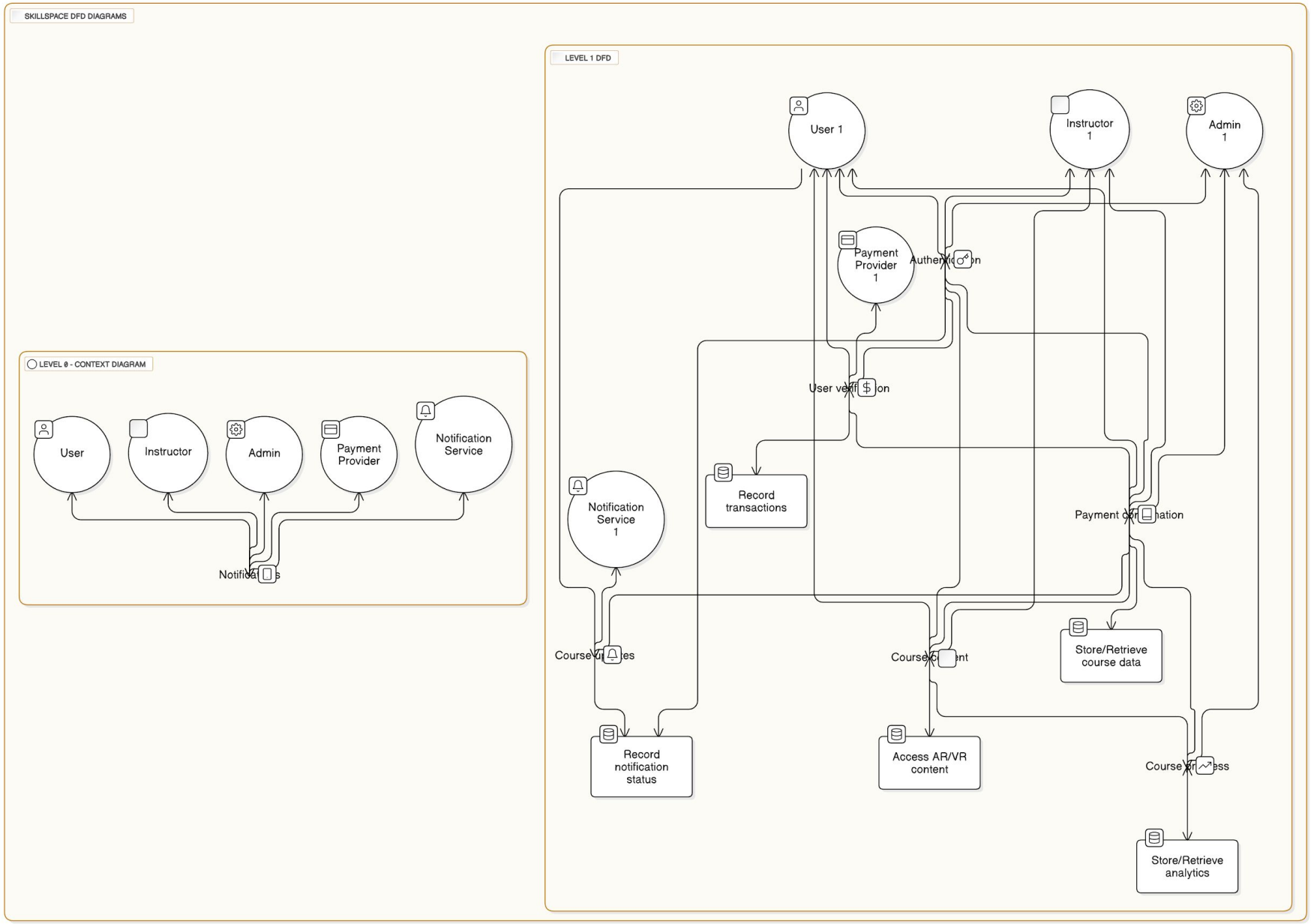
System Architecture



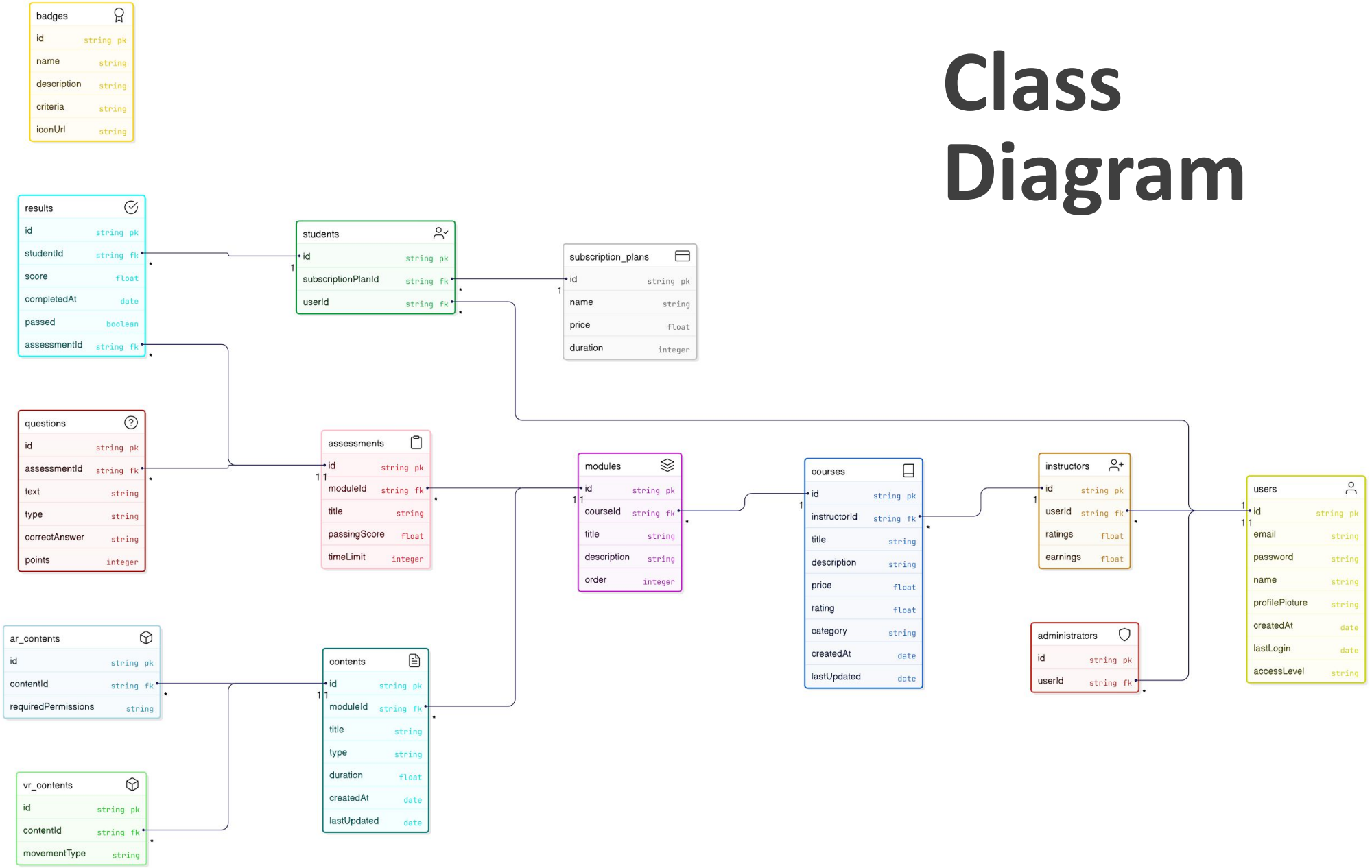
ER Diagram


Course
LearningPath
CourseBenefits
CoursePrerequisites
ARMarker
VREnvironment
PathCourseMappings
CourseData
User
SubscriptionPlan
Badge
CourseQuestions
Orders
VideoCompleteHistory
QuizesCompleteHistory
SocialLogin
Subscription
UserBadges
Leaderboard
UserAnalytics
CourseLinks
Quizes
Reviews
Tickets
Discussion
CourseQuestionAnswers
Notification
ReviewReplies
TicketReply
DiscussionReply

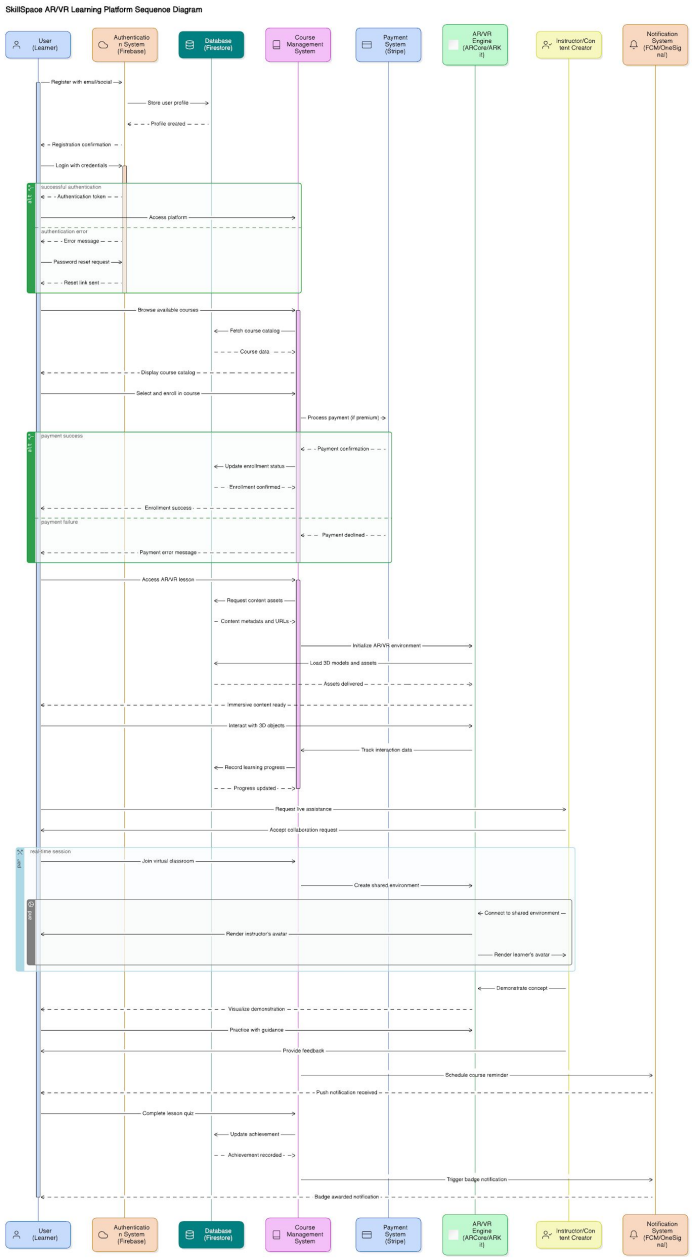
DFD Diagram


SKILLSPACE DFD DIAGRAMS
LEVEL 0 - CONTEXT DIAGRAM
User
Instructor
Admin
Payment Provider
Notification Service
LEVEL 1 DFD
User 1
Instructor 1
Admin 1
Payment Provider 1
Notification Service 1
Record transactions
Record notification status
Access AR/VR content
Store/Retrieve course data
Store/Retrieve analytics

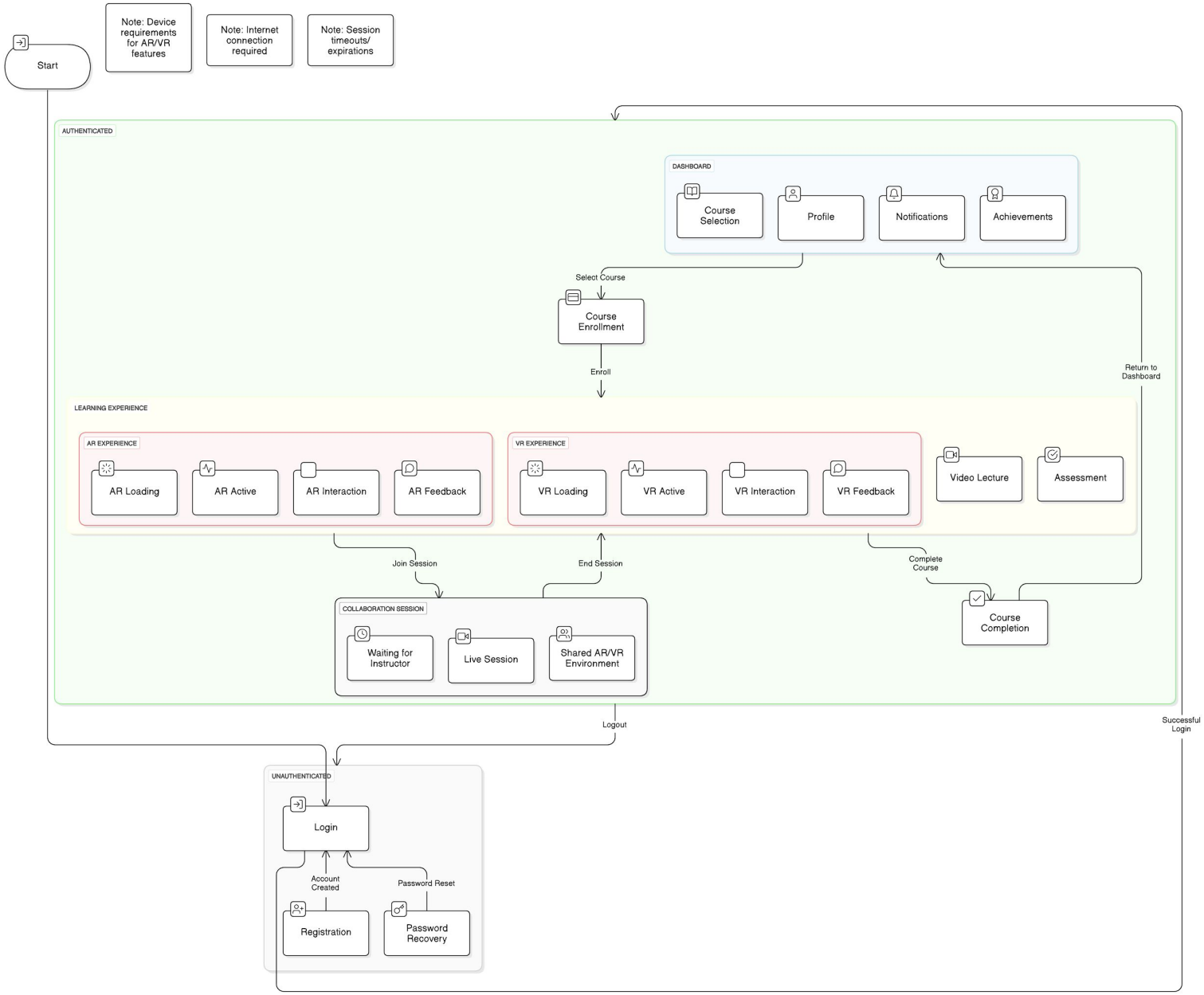
Class Diagram



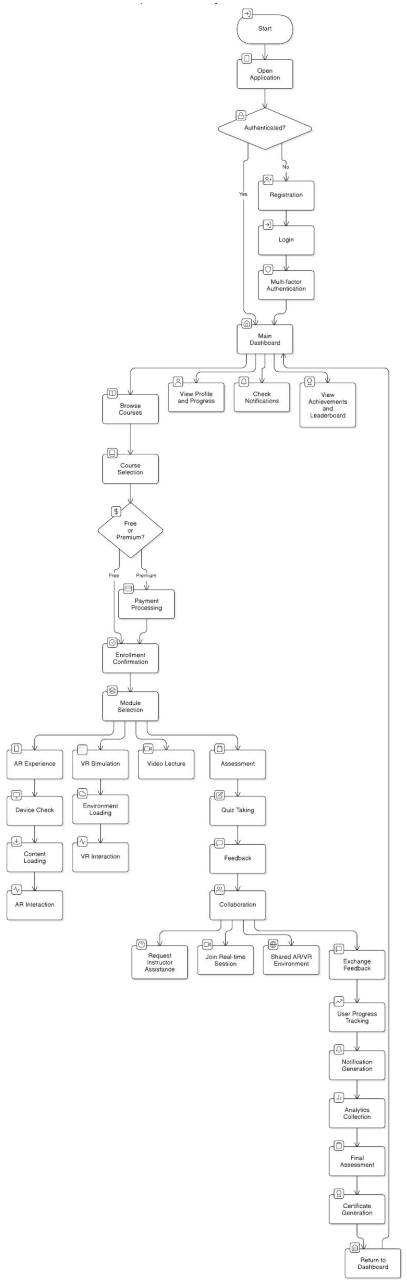
Interaction Diagram



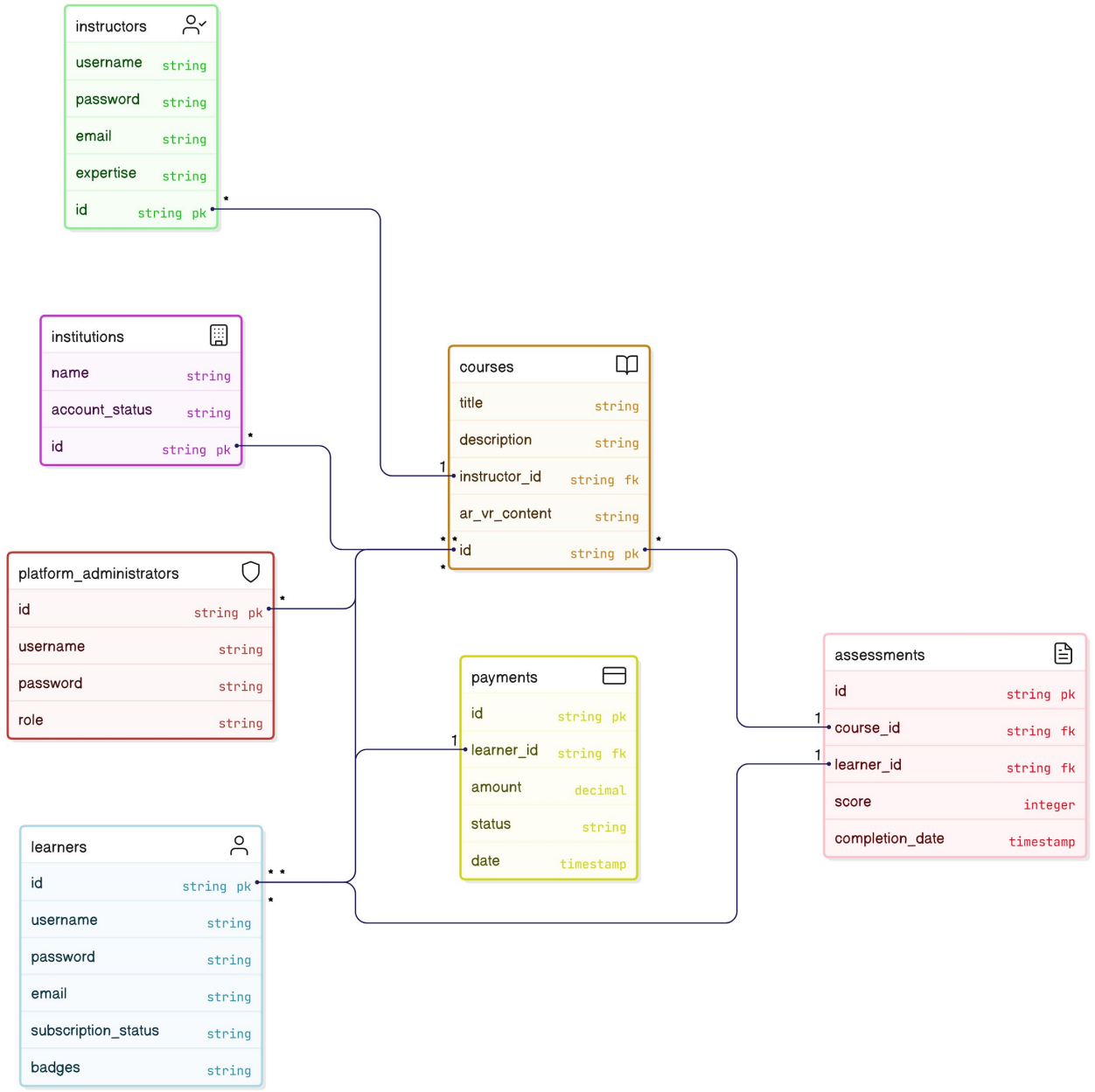
State Chart


Start
Note: Device requirements for AR/VR features
Note: Internet connection required
Note: Session timeouts/ expirations
AUTHENTICATED
DASHBOARD
Course Selection
Profile
Notifications
Achievements
Select Course
Course Enrollment
Enroll
Return to Dashboard
LEARNING EXPERIENCE
AR EXPERIENCE
AR Loading
AR Active
AR Interaction
AR Feedback
VR EXPERIENCE
VR Loading
VR Active
VR Interaction
VR Feedback
Video Lecture
Assessment
Join Session
End Session
Complete Course
COLLABORATION SESSION
Waiting for Instructor
Live Session
Shared AR/VR Environment
Course Completion
Logout
Successful Login
UNAUTHENTICATED
Login
Account Created
Password Reset
Registration
Password Recovery

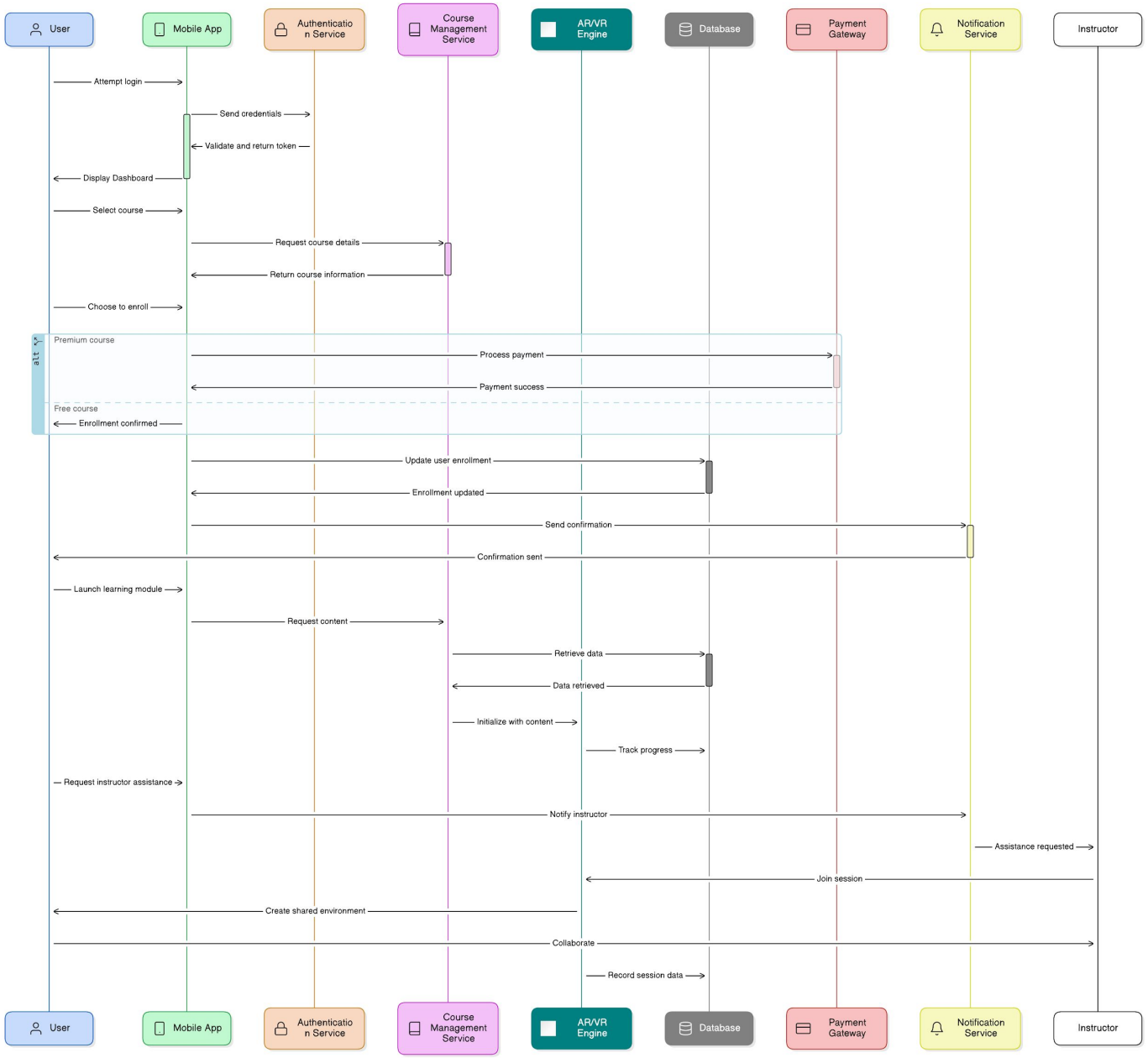
Activity Diagram



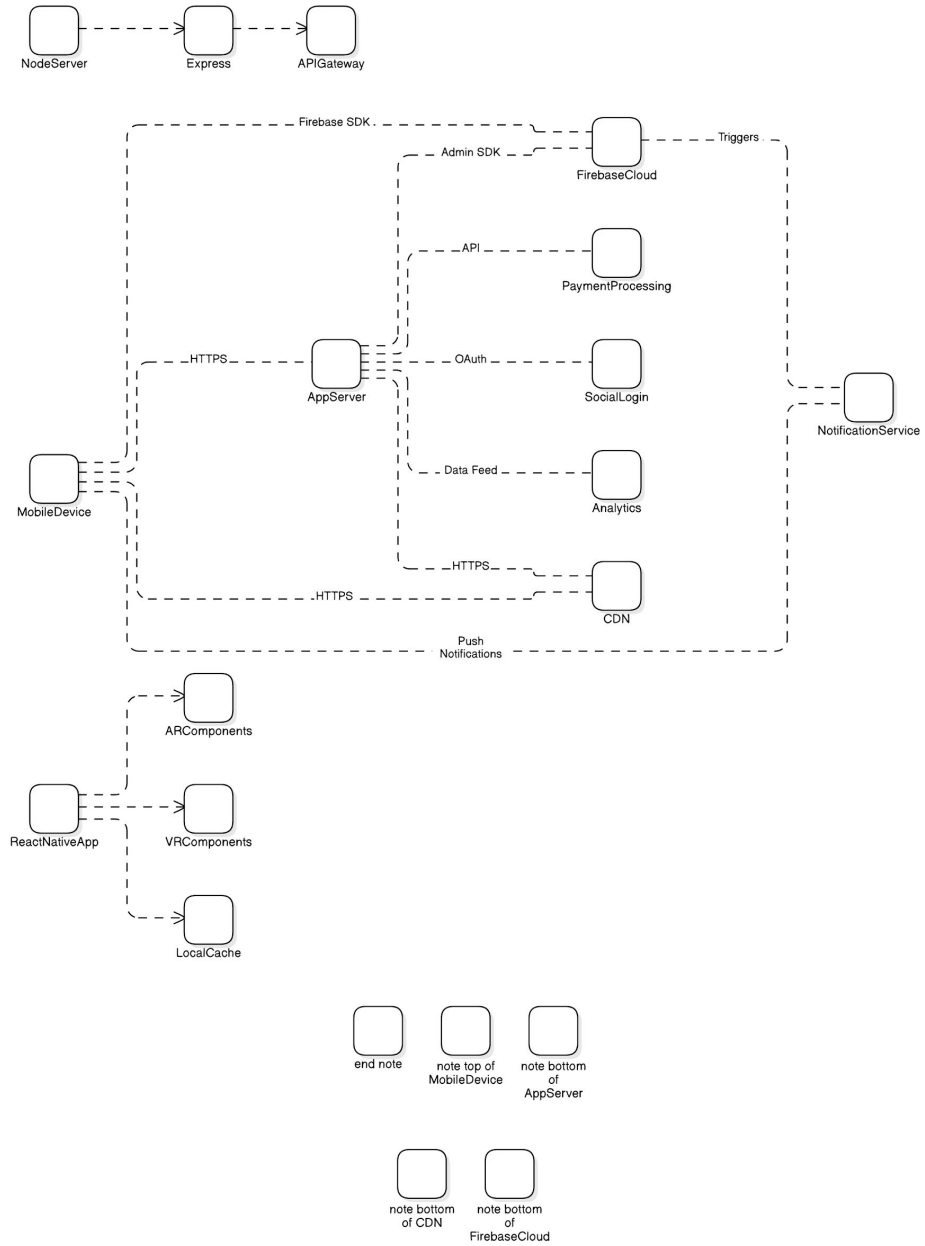
Use Case Diagram

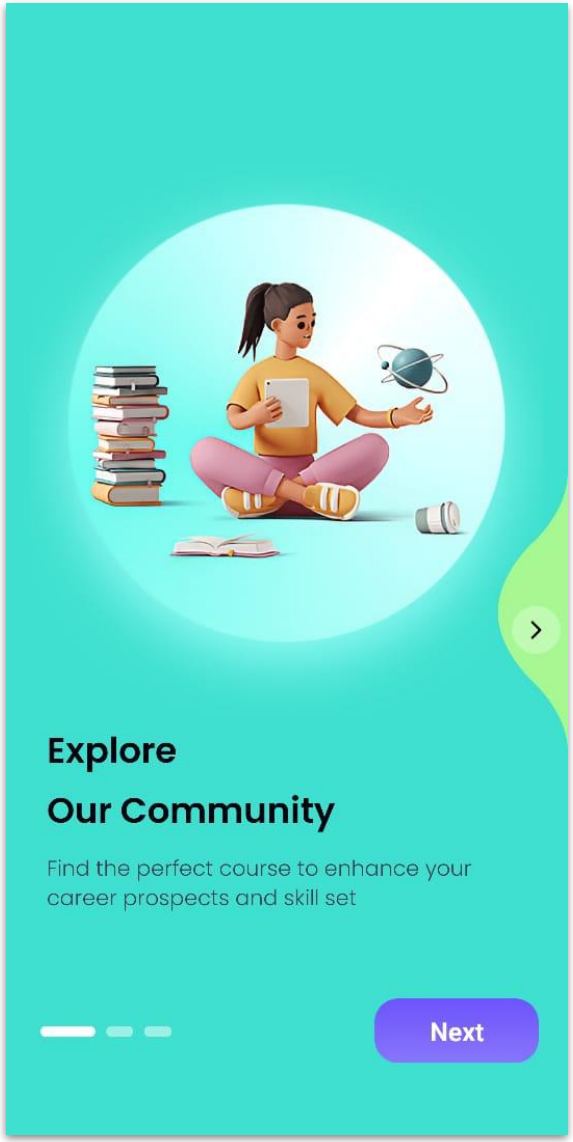


Sequence Diagram

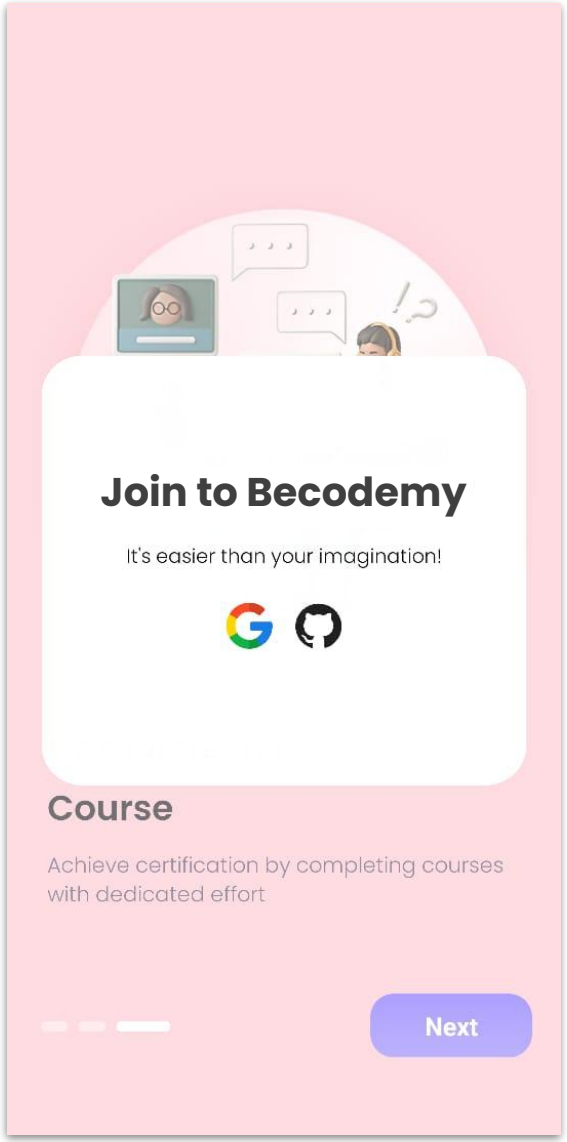


Deployment Diagram

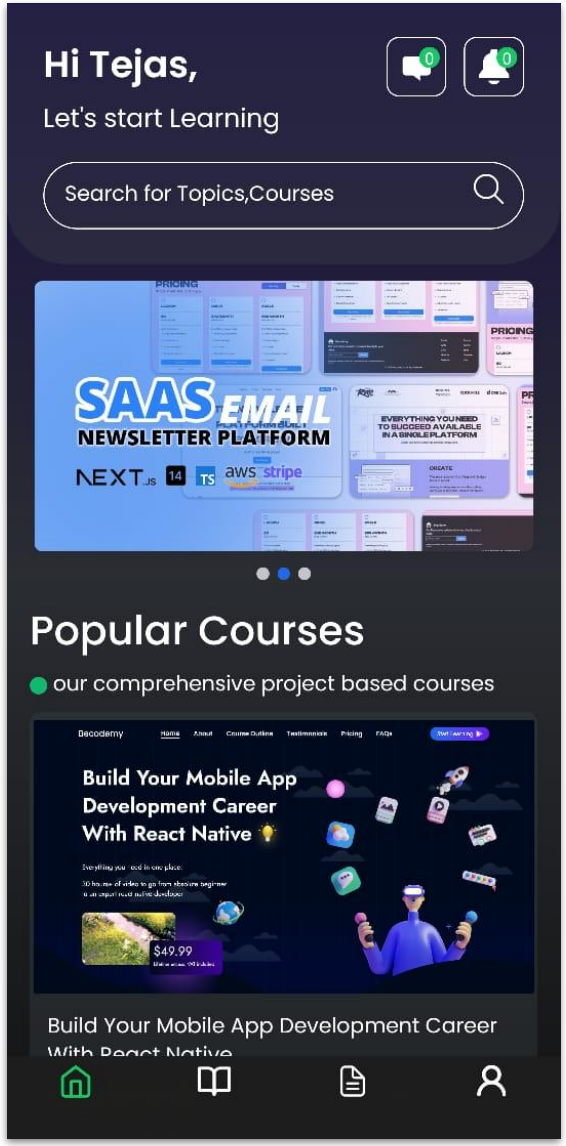




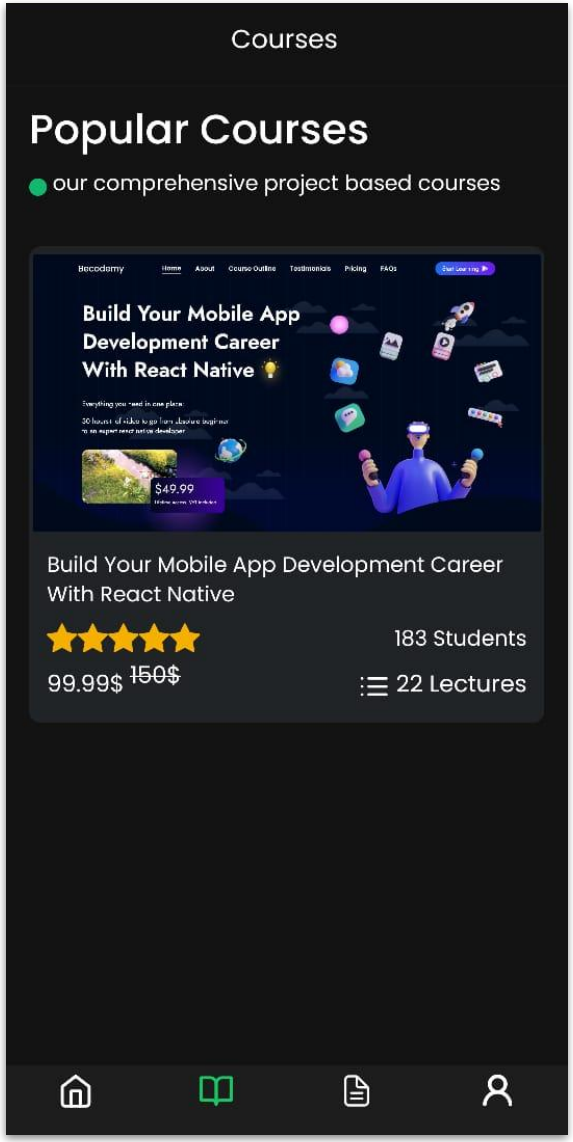
Splash Screen



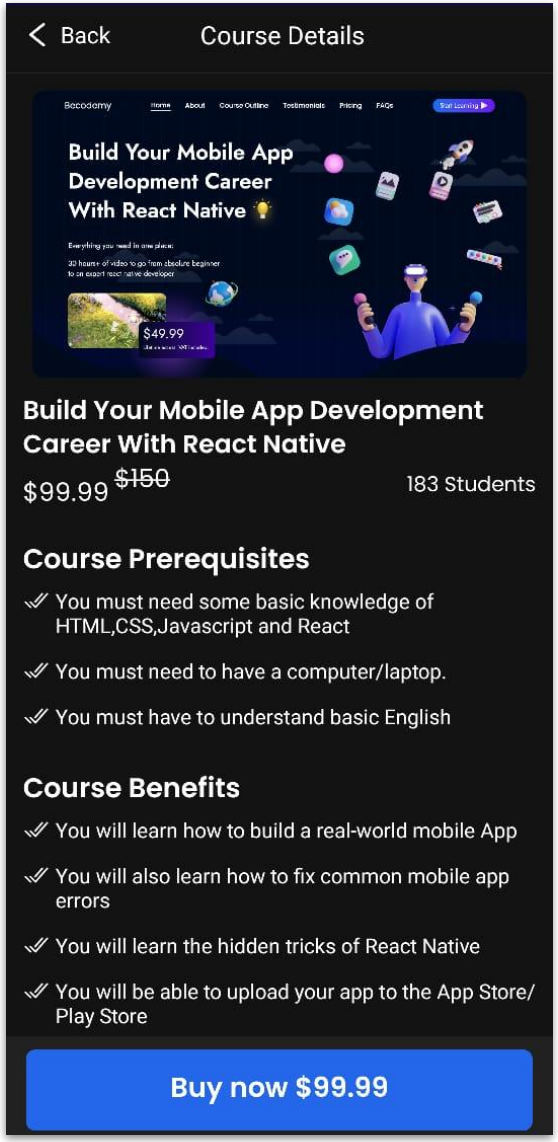
Log-in Screen



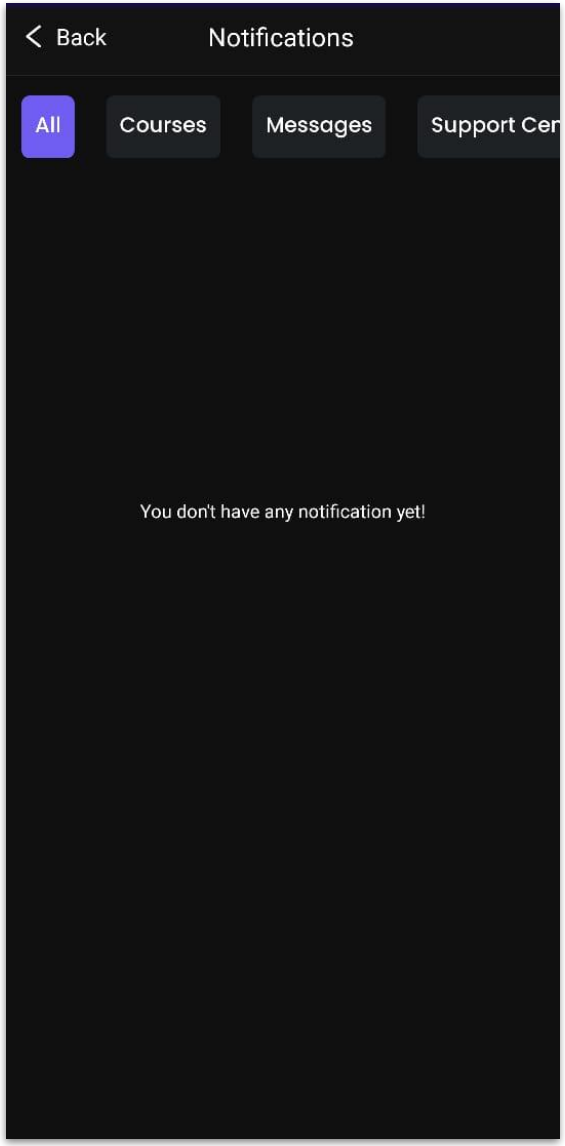
Home Screen



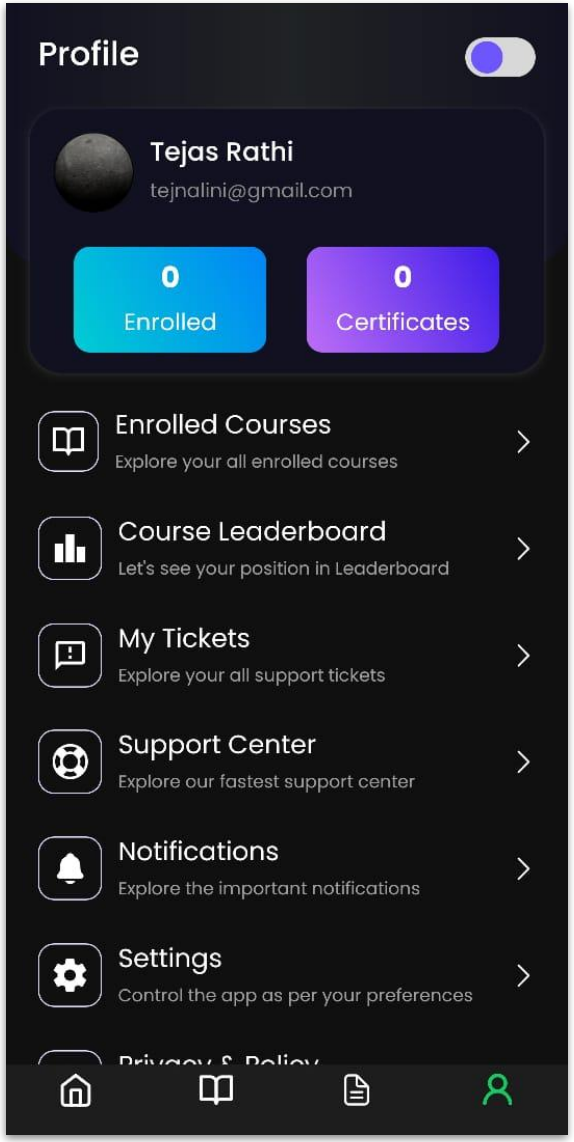
Courses Screen

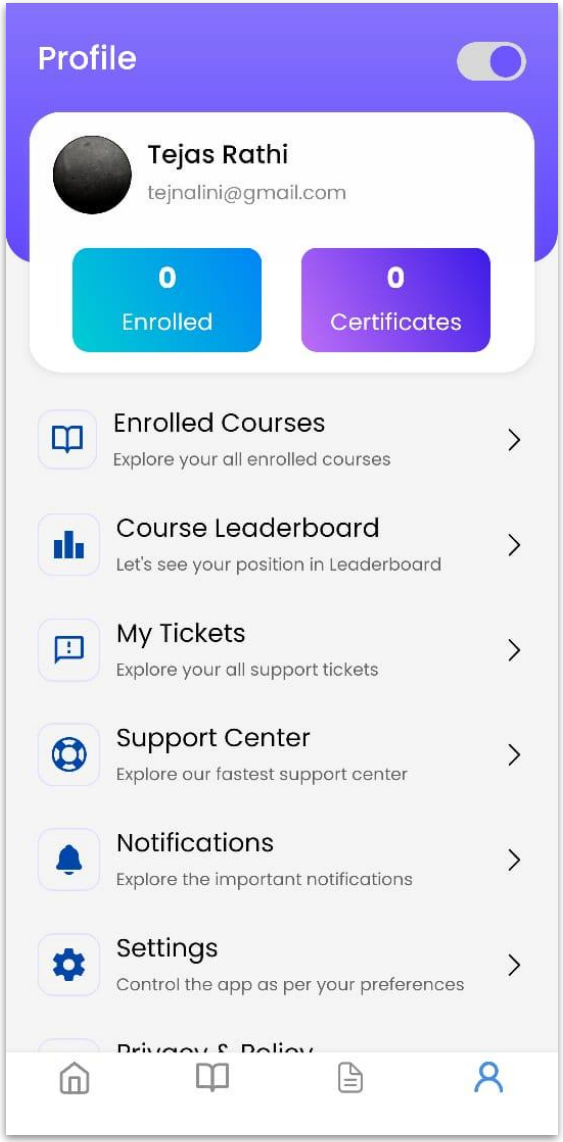


Course Detail Screen



Notification Screen





Dark and Light Theme

Thank You