Department of CS

University of Gujrat

IELTS Preparation Web

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Submitted By

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Statement of Submission

This is certify that **M. Abdul Wahab Roll No. 21014119-006** and **M. Ahmed Roll No. 21014119-047** and **M.Furqan Roll No. 21014119-060** has successfully completed the final year project named as IELTS Preparation Web at the Department of Computer Science, University of Gujrat, to fulfill the requirement of the degree of Bachelor of Science **in Computer Science**.

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HOD/Chairperson

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We truly acknowledge the cooperation and help make by Mr. Abo Bakar Aslam. He has been a constant source of guidance throughout the course of this project. We would also like to thank him for his help and guidance throughout this project. We are also thankful to our friends and families whose silent support led us to complete our project.

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Abstract

The IELTS Preparation Web is a comprehensive online platform designed to enhance IELTS exam readiness through interactive practice tests, real-time feedback, and personalized learning tools. Built with React for the frontend, Python frameworks (FastAPI/Flask/Django) for the backend, and NLP (NLTK, SpaCy) for automated evaluation of writing and speaking tasks, the system provides tailored feedback on grammar, coherence, and pronunciation. Key features include progress tracking, secure user authentication, admin-managed study materials, and automated scoring, ensuring an efficient and scalable solution for IELTS aspirants. By leveraging modern web technologies and intelligent analytics, the platform delivers an engaging and effective learning experience, addressing the challenges of traditional IELTS preparation methods.

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Chapter 1: Project Feasibility Report

1.1. Introduction

The IELTS Preparation Web is an innovative and comprehensive platform designed to assist students in enhancing their English language skills and preparing effectively for the IELTS exam. This web-based solution leverages modern technologies, including React for the frontend, Python frameworks (FastAPI, Flask, or Django) for the backend, and Natural Language Processing (NLP) for intelligent feedback, to create an interactive and user-friendly learning environment. The platform offers a wide range of features, such as practice tests, progress tracking, personalized recommendations, and real-time feedback on writing and speaking tasks. By integrating advanced NLP techniques, the system provides automated evaluation of grammar, coherence, pronunciation, and fluency, ensuring a tailored learning experience for each user. With a secure and scalable database architecture (MySQL or MongoDB), the platform efficiently manages user data, study materials, and performance analytics. The IELTS Preparation Web aims to deliver a seamless, high-performance solution that supports students in achieving their desired IELTS scores while offering an intuitive and engaging interface for an enhanced learning experience.

1.2. Project/Product Feasibility Report

The Project Feasibility Report for the IELTS Preparation Web aims to evaluate the practicality and viability of developing a comprehensive online platform to assist students in preparing for the IELTS exam. This report assesses the feasibility of the project by analyzing critical factors such as the availability of required data, the technical expertise of the development team, the time required for implementation, and the necessary hardware and software resources. It examines whether the proposed system, which includes features like practice tests, progress tracking, personalized feedback, and advanced NLP-based evaluation, can be successfully developed and deployed to meet the needs of IELTS aspirants. The feasibility analysis ensures that the platform will deliver significant value by providing an intuitive, scalable, and interactive learning experience. Continuous feasibility assessments will be conducted throughout the project lifecycle to ensure its successful execution and alignment with the goals of enhancing English language proficiency and IELTS preparation for users. There are many types of feasibilities:

- Technical
- Operational
- Economic
- Schedule
- Specification
- Information

- Motivational
- Legal and Ethical

1.2.1. Technical Feasibility

Technical Feasibility assesses whether the IELTS Preparation Web can be developed using current technology and the team's technical expertise. The project leverages well-established technologies like React for the frontend, Python frameworks (FastAPI, Flask, or Django) for the backend, and NLP libraries (NLTK, SpaCy) for intelligent feedback, ensuring the platform's functionality. The team, comprising Computer Science students supervised by an experienced lecturer, possesses the necessary skills in these areas. Tools like Visual Studio Code, GitHub, and Docker further streamline development and deployment. With these resources and expertise, the project is technically feasible and can be successfully implemented within the proposed scope.

1.2.2. Operational Feasibility

Operational Feasibility evaluates whether the IELTS Preparation Web can be effectively operated by the intended users and managed by the team. The primary focus is on assessing whether the platform solves a significant problem—enhancing IELTS preparation—and whether the proposed solution is practical and beneficial for end users. The platform's features, such as practice tests, progress tracking, and NLP-based feedback, are designed to address the needs of IELTS aspirants, making it a valuable tool for improving English language skills. Feedback from potential users indicates strong support for the platform, as it offers an intuitive and interactive learning experience. Therefore, the project is operationally feasible, as it provides a meaningful solution to a real problem and is well-received by both end users and managers.

1.2.3. Economic Feasibility

Economic Feasibility assesses the financial viability of the IELTS Preparation Web by analyzing the costs and benefits associated with the project. The cost estimates include development costs and maintenance costs (ongoing expenses like server hosting, updates, and technical support). These costs can be estimated by breaking the project into tasks and using lifecycle cost models, with insights from similar projects to ensure accuracy. On the other hand, the benefit estimates include both tangible and intangible benefits. Tangible benefits may include potential revenue from subscription fees or reduced costs for users who no longer need expensive coaching. Intangible benefits, such as improved user satisfaction, enhanced learning outcomes, and the platform's reputation as a reliable IELTS preparation tool, also add significant value. By comparing the costs and benefits, the project demonstrates economic feasibility, as the long-term advantages of providing an accessible, high-quality learning platform outweigh the initial and ongoing expenses.

1.2.4. Schedule Feasibility

Schedule Feasibility evaluates whether the IELTS Preparation Web can be completed within the proposed timeline using the available resources and team. Time is a critical factor, and the project's success depends on meeting deadlines and milestones effectively. The project is divided into manageable tasks, with a clear timeline outlined in the Gantt chart, ensuring that each phase—such as frontend development, backend integration,

NLP implementation, and testing—is completed on schedule. The team, consisting of skilled students supervised by an experienced lecturer, has the necessary expertise to execute the tasks efficiently. Regular progress reviews and adjustments will be made to address any delays or challenges. Given the well-structured plan and the team's capabilities, the project is schedule-feasible and can be delivered within the stipulated timeframe.

1.2.5. Specification Feasibility

Specification Feasibility examines whether the requirements for the IELTS Preparation Web are clear, well-defined, and achievable within the project's scope. The platform's key features, such as practice tests, progress tracking, NLP-based feedback, and secure user management, have been clearly outlined to meet the needs of IELTS aspirants. The scope boundaries are well-defined, ensuring that the project focuses on delivering a user-friendly and scalable solution without unnecessary complexity. The requirements have been thoroughly discussed and documented, ensuring alignment with the goals of enhancing IELTS preparation. By maintaining clear and definite specifications, making it feasible to develop a solution that meets user expectations and project objectives.

1.2.6. Information Feasibility

Information Feasibility assesses whether the data and information required for the IELTS Preparation Web are complete, reliable, and meaningful. The platform relies on accurate and comprehensive data, such as study materials, practice test questions, and user performance metrics, to deliver an effective learning experience. The information gathered from reputable sources, including IELTS guidelines and educational resources, ensures reliability and relevance. Additionally, the use of NLP for feedback requires high-quality datasets to provide meaningful and accurate evaluations of writing and speaking tasks. By ensuring that the information is complete, trustworthy, and aligned with user needs, the project demonstrates information feasibility, enabling the platform to deliver valuable and actionable insights to IELTS aspirants.

1.2.7. Motivational Feasibility

Motivational Feasibility evaluates the level of motivation and commitment of the team and stakeholders involved in the IELTS Preparation Web project. The success of the project depends on the team's willingness to perform tasks correctly and promptly, ensuring timely delivery and high-quality outcomes. Additionally, the potential positive impact of the platform on users' IELTS preparation serves as a driving force for the team. With high motivation and a clear sense of purpose, the project is well-positioned to achieve its goals effectively.

1.2.8. Legal & Ethical Feasibility

Legal & Ethical Feasibility examines whether the IELTS Preparation Web complies with legal standards and ethical guidelines, ensuring that no infringements or liabilities arise from the project. The platform will adhere to data protection laws, such as GDPR or local regulations, to safeguard user information and maintain privacy. Ethical considerations, such as fair use of educational content, proper attribution of resources, and unbiased NLP-based feedback, will also be prioritized. Additionally, the project will ensure compliance with intellectual property laws when using third-party materials or

technologies. By addressing these legal and ethical aspects, the project minimizes risks and ensures that the platform operates responsibly, fostering trust and credibility among users.

1.3. Project/Product Scope

The **scope** of the **IELTS Preparation Web** defines the boundaries of the system, outlining what is included within the project and what lies outside its context. The scope is determined by the set of requirements allocated to the platform, ensuring that the project remains focused and manageable within the available resources of time, people, and budget. The primary focus of the project is to develop a comprehensive web-based platform that provides IELTS aspirants with tools such as practice tests, progress tracking, personalized feedback, and NLP-based evaluation for writing and speaking tasks.

The **in-scope** features include:

- A user-friendly frontend built with **React** for seamless navigation and interaction.
- A robust backend using **Python frameworks** for efficient data handling and API management.
- Integration of **NLP techniques** for intelligent feedback on user responses.
- Secure and scalable database architecture using **MySQL** or **MongoDB** for storing user data and study materials.
- Features like practice tests, progress tracking, and personalized recommendations to enhance the learning experience.

1.4. Project/Product Costing

Metrics play a crucial role in the software development process by providing measurable insights into both the product and the process. These measurements help in evaluating, predicting, and monitoring various aspects of development, ensuring that the project stays on track and meets its objectives. Metrics are broadly categorized into two types:

Knowledge-Oriented Metrics: These focus on tracking the development process to evaluate, predict, or monitor specific aspects, such as progress, resource utilization, or potential risks.

Achievement-Oriented Metrics: These are centered around measuring product-related aspects, often tied to the overall quality of the product, such as functionality, performance, or user satisfaction.

In the field of cost estimation, much of the work revolves around algorithmic cost modeling. This approach uses mathematical formulas to link costs or inputs with relevant metrics, producing an estimated output. These formulas are derived from historical data analysis, making them a reliable basis for predicting project costs. The accuracy of these models can be further enhanced by calibrating them to the specific development environment, which involves adjusting the weightings of the metrics to better reflect the unique characteristics of the project.

By leveraging these metrics and cost estimation techniques, we can ensure a more

accurate and reliable prediction of the resources, effort, and time required for the IELTS Preparation Web project, ultimately leading to better planning and successful project execution.

1.4.1. Project Cost Estimation By Function Point Analysis

Type of Component	Low	Average	High	Total
External Inputs	7 × 3 = 21	10 × 4 = 40	8 × 6 = 48	109
External Outputs	8 × 4 = 32	9 × 5 = 45	9 × 7 = 63	140
External Inquiries	2 × 3 = 6	3 × 4 = 12	2 × 6 = 12	30
Internal Logical Files	1 × 7 = 7	3 × 10 = 30	2 × 15 = 30	67
External Interface Files	1 × 5 = 5	2 × 7 = 14	3 × 10 = 30	49
Total Unadjusted Function Points (UFP)				395

Adjustment Factor Calculation

Using the complexity factors:

Factor	Value
Data communication	2
Performance	5
Distributed data processing	4
Heavily used configuration	1
Transaction rate	0
On-line data entry	3
Installation ease	0
Operational ease	2

End-user efficiency	5
On-line update	4
Complex processing	1
Multiple sites	3
Facilitate change	3
Reusability	3
Total Complexity Factor (∑Fi)	36

FP=395×(0.65+0.01×36)
F=395×(0.65+0.36)
FP=395×1.01=398.95

LOC Estimation

Using the Language Factor = 25:

LOC=398.95×25=9973.75
KLOC=9973.75/1000=9.97

Cost & Effort Estimation

Let:

- Labour Rate = 30,000 PKR/month
- Productivity = 40 FP/PM

Cost Per FP

30,000/40 =750 PKR/FP

Total Project Cost

398.95×750=299,212.5 PKR

Total Estimated Effort

398.95/40=9.97 PM

1.4.2. Project Cost Estimation by using COCOMO'81 (Constructive Cost Model) Following the Organic Mode:

Step 1: Identify Inputs

KLOC (Estimated) = **9.97** (from FPA)

Effort Adjustment Factor (EAF) =

Programming capability = 1.00

Programming language experience = 1.07

Use of software tools = 0.91

Required software reliability = 1.15

EAF=1.00×1.07×0.91×1.15=1.11

Step 2: Compute Effort (PM)

Using the **COCOMO** effort formula:

PM=3.2×((KLOC)^1.05)×EAF
PM=3.2×((9.97)^1.05)×1.11
PM=3.2×10.43×1.11
PM=37.02 Person-Months

Step 3: Compute Development Time (TD)

Using the **COCOMO** duration formula:

TD=2.5×((PM)^0.38)
TD=2.5×((37.02)^0.38)
TD=2.5×4.02
TD=10.05 Months

1.4.3. Activity Based Costing

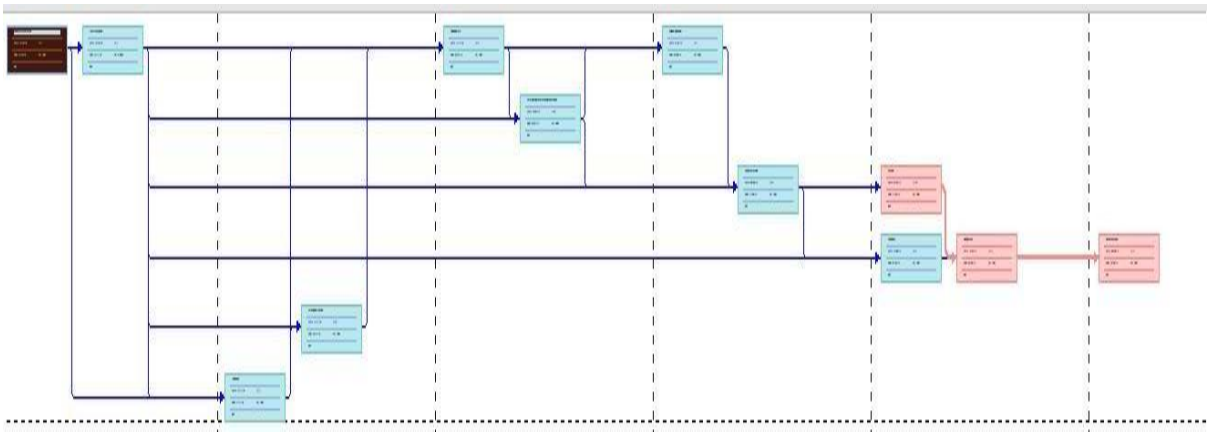
Activity	Time Interval	Cost (In Rs)
User Interface (Frontend Development: React UI, Login, Dashboard, Practice Tests, Profile Management, Study Material UI, etc.)	1 to 1.5 Months	10,000
Database Connection & Integration (User Profiles, Test Results, NLP Feedback, Study Material Storage, etc.)	15 to 20 Days	2,000

Registration & Authentication (User Registration, JWT Authentication, Role-Based Access Control, Admin/User Management)	1 to 1.5 Months	5,000
Backend Development (FastAPI/Flask APIs, CMS for Learning Material, NLP Integration, Scoring System, Notifications, etc.)	2 to 3 Months	10,000
Testing (Unit Testing, Integration Testing, Performance Testing, Bug Fixes, Security Testing, etc.)	10 to 15 Days	12,000
Deployment & Release (Hosting, Server Configuration, Database Setup, Final Bug Fixes, Documentation, Maintenance Setup)	1 Month	15,000

1.5. Task Dependency Table

Task ID	**Task**	**Dependencies**	**Duration (WEEKS)**
1	Requirement gathering	-	2
T2	Interface design	T1	4
T3	Login page	T1, T2	2
T4	Practice test module creation	T2, T3	2
T5	Upload study materials (PDFs, videos)	T2, T3, T4	2
T6	Formulate data sets & integrate NLP models	T1, T2, T5	3
T7	Build & Train NLP models for feedback	T5, T6	9
T8	Social interaction	T2, T6, T7	2
T9	Feedback	T2, T8	2
T10	Testing	T7, T8	3
T11	Deployment	T9, T10	2
T12	Documentation	T11	3

1.6. CPM - Critical Path Method



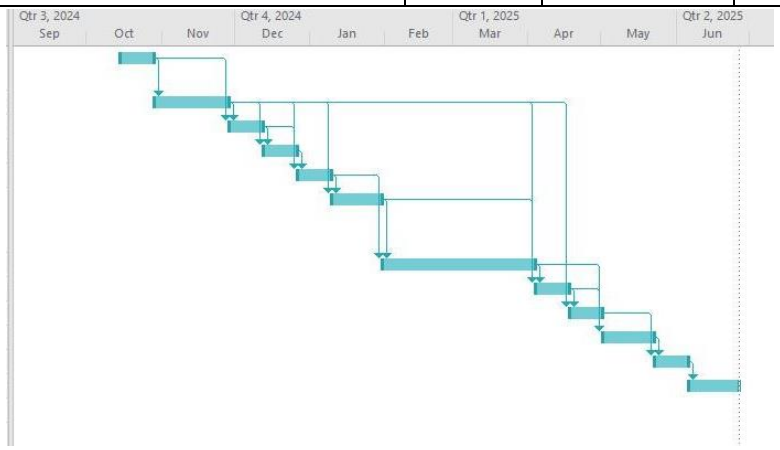
Task	Duration	ES	EP	LS	LF	ST
T1	2	0	2	0	2	0
T2	4	2	6	10	14	-
T3	2	4	6	12	12	-
T4	2	2	4	16	12	-
T5	2	2	4	14	12	-
T6	3	2	5	12	5	-
T7	9	3	12	9	12	-
T8	2	9	11	2	11	-
T9	2	2	4	2	4	-
T10	3	2	5	2	2	0
T11	2	3	5	3	5	0
T12	3	2	5	2	5	0

Critical Path:
T1,T10,T11,T12

1.7. Gantt chart

Task Name	Duration	Start	Finish
Requirement Gathering	2 wks	Tue 15/10/24	Mon 28/10/24
Interface Design	4.6 wks	Tue 29/10/24	Thu 28/11/24
Login Page	2 wks	Fri 29/11/24	Thu 12/12/24
Practice Test Module Creation	2 wks	Fri 13/12/24	Thu 26/12/24
Upload Study Materials (PDFs, Videos)	2 wks	Fri 27/12/24	Thu 09/01/25

Formulate Data Sets & Integrate NLP Models	3 wks	Fri 10/01/25	Thu 30/01/25
Build & Train NLP Models for Feedback	9 wks	Fri 31/01/25	Thu 03/04/25
Social Interaction	2 wks	Fri 04/04/25	Thu 17/04/25
Feedback	2 wks	Fri 18/04/25	Thu 01/05/25
Testing	3 wks	Fri 02/05/25	Thu 22/05/25
Deployment	2 wks	Fri 23/05/25	Thu 05/06/25
Documentation	3 wks	Fri 06/06/25	Thu 26/06/25



1.8. Introduction to Team member and their skill set

ID	Name	Roll No	Skill set
M1	[]	[]	Documentation,coding,system Architecture&Design,Graphics
M2	[]	[]	Documentation,coding,Graphics,Testing
M3	[]	[]	Documentation,coding,system Architecture&Design,Testing

1.9. Task and Member Assignment Table

Task ID	Task	Dependencies	Duration	Members
T1	Requirement gathering	-	2	M1,M2,M3
T2	Interface design	T1	4	M1,M2
T3	Login page	T1,T2	2	M1,M2,M3
T4	Practice Test Module Creation	T2,T3	2	M1,M2,M3

T5	Upload Study Materials (PDFs, Videos)	T2,T3,T4	2	M1,M2,M3
T6	Formulate Data Sets & Integrate NLP Models	T1,T2,T5	3	M1,M3
T7	Build & Train NLP Models for Feedback	T5,T6	9	M1,M2,M3
T8	Social interaction	T2,T6,T7	2	M1,M2,M3
T9	Feedback	T2,T8	2	M1,M2,M3
T10	Testing	T7,T8	3	M2,M3
T11	Deployment	T9,T10	2	M1,M2,M3
T12	Documentation	T11	3	M1,M2,M3

1.10. Tools and Technology with reasoning

React: React is used to create a dynamic and interactive user interface. It enables the development of a responsive and user-friendly frontend, allowing for smooth navigation and seamless interaction for IELTS aspirants. Its component-based architecture ensures modularity and reusability, making the development process efficient.

FastAPI: FastAPI is chosen for its high performance and ease of use in API management. It supports asynchronous operations, making it ideal for handling large volumes of user requests efficiently. Its automatic documentation generation also simplifies the development and testing process.

Flask or Django: Flask or Django is utilized for handling additional backend logic and integration needs. Flask offers flexibility and simplicity for smaller components, while Django provides a more structured approach with built-in features for larger-scale applications. Both frameworks ensure robust backend functionality.

NLP Libraries (NLTK, SpaCy): These libraries are integrated to provide intelligent feedback on user responses in the writing and speaking modules. NLTK and SpaCy offer advanced natural language processing capabilities, enabling the platform to evaluate grammar, coherence, pronunciation, and fluency, thereby enhancing the learning experience.

Database (MySQL or MongoDB): A database is essential for efficient data management and retrieval. MySQL is used for structured data like user profiles and test results, while MongoDB handles unstructured data such as NLP feedback and study materials. Both ensure secure and scalable data storage.

Docker: Docker is used to containerize the application, making it easy to deploy and manage across various environments. It ensures consistency in development, testing, and production environments, simplifying the deployment process and improving scalability.

1.11. Vision Document

The **Vision Document** provides a clear and shared understanding of the **IELTS Preparation Web** project, outlining its objectives, scope, and key requirements. It serves as the foundation for detailed project planning and development, ensuring that all stakeholders are aligned and committed to delivering a high-quality platform that meets the needs of IELTS aspirants. Our main goal is to provide IELTS aspirants with an accessible, interactive, and intelligent platform to enhance their English language skills and prepare effectively for the IELTS exam. Our web-based platform will offer features like practice tests, progress tracking, and personalized feedback using advanced NLP techniques, ensuring a comprehensive learning experience.

- **Cover All IELTS Preparation Needs:** Our platform will cater to all sections of the IELTS exam—Listening, Reading, Writing, and Speaking. It will provide tailored practice tests and real-time feedback to help users improve their performance.
- **Personalized Learning:** The platform will adapt to each user's strengths and weaknesses, offering customized recommendations and progress tracking to ensure targeted improvement.
- **Intelligent Feedback:** Using NLP, the platform will evaluate writing and speaking tasks, providing detailed feedback on grammar, coherence, pronunciation, and fluency, helping users refine their skills.
- **Accessible and User-Friendly:** The platform will be designed with a simple, intuitive interface, making it easy for users of all levels to navigate and utilize its features effectively.
- **Community Engagement:** Users will be able to connect with other IELTS aspirants, share tips, and discuss strategies, fostering a supportive learning community.

1.12. Risk List

- Difficulty in implementing accurate and reliable NLP models for evaluating writing and speaking tasks.
- The platform may not handle large volumes of users or data efficiently.
- The platform may not attract enough users due to lack of awareness or competition.
- Difficulty in integrating frontend, backend, and database components seamlessly.
- Unexpected bugs or compatibility issues during development or deployment.

1.13. Product Features/ Product Decomposition

Our product decomposes into small parts, which are given below:

Practice Tests:

The platform offers a variety of practice tests for all IELTS sections (Listening, Reading, Writing, and Speaking), designed to simulate the actual exam environment and help users familiarize themselves with the test format.

Progress Tracking:

A progress tracking feature allows users to monitor their performance over time, identifying strengths and weaknesses to focus on areas that need improvement.

Personalized Feedback:

Using advanced NLP techniques, the platform provides detailed, real-time feedback on writing and speaking tasks, evaluating grammar, coherence, pronunciation, and fluency to help users refine their skills.

Interactive Exercises:

Interactive exercises are included to engage users in active learning, covering vocabulary, grammar, and comprehension to enhance overall English proficiency.

User Profiles:

User profiles store individual progress, test results, and personalized recommendations, creating a tailored learning experience for each user.

Content Management System (CMS):

A CMS allows administrators to upload, organize, and update study materials such as PDFs, slides, and video lectures, ensuring users have access to the latest resources.

Notification System:

Email and push notifications keep users informed about new materials, test results, and platform updates, ensuring they stay engaged and up-to-date.

Admin Dashboard:

An admin dashboard provides tools for managing users, content, and platform activity, along with detailed reporting to track user performance and system usage.

Security Layer:

The platform includes robust security measures such as data encryption and role-based access control to protect user data and ensure secure access for all users.

These features work together to create a comprehensive, user-friendly, and intelligent platform for IELTS preparation, addressing the diverse needs of users and ensuring an effective learning experience.

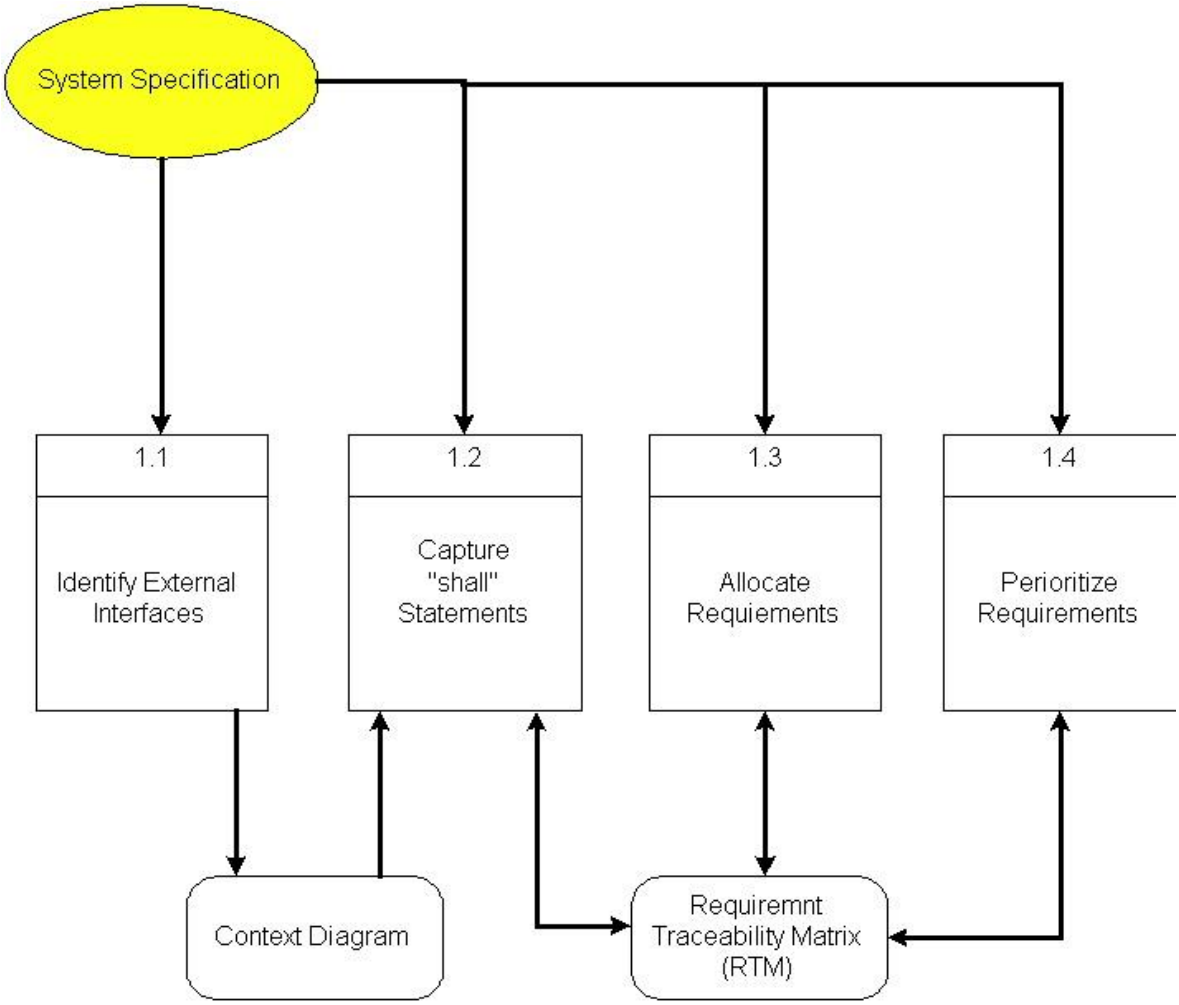
Chapter 2: Software Requirement Specification (For Object Oriented Approach)

2.1 Introduction:

The **Software Requirement Specification (SRS)** is a critical document in the software development lifecycle, especially when adopting an **object-oriented approach**. It serves as the foundation for understanding, defining, and documenting the system's functional and non-functional requirements.

The primary goal of the SRS is to capture, structure, and accurately represent the user's requirements in a way that ensures the final system meets those requirements effectively. This process is essential for delivering a high-quality system that aligns with user expectations and business objectives. In the context of the **IELTS Preparation Web** project, the SRS will serve as a comprehensive guide for developing a user-centric, scalable, and intelligent platform for IELTS aspirants. By following an object-oriented approach, the SRS will emphasize modularity, reusability, and scalability, ensuring that the system is both robust and adaptable to future needs.

- Requirements elicitation
- Requirements analysis and negotiation
- Requirements specification
- System modeling
- Requirements validation
- Requirements management



Here, requirements specification is to be discussed. Requirements specification would lead to the following four steps:

- Identify external interfaces
- Development of context diagram
- Capture “shall statements
- Allocate requirements
- Prioritize requirements
- Development of requirements traceability matrix

2.1.1 Systems Specifications

The following are the clauses that must be included while describing the system specifications.

Introduction

For the **IELTS Preparation Web** project, this section will introduce the platform as an intelligent, web-based solution designed to assist IELTS aspirants in enhancing their

English language skills. It will briefly describe the system's purpose, which is to provide a comprehensive and interactive learning experience through features like practice tests, progress tracking, and personalized feedback using NLP techniques. The introduction will also highlight the system's alignment with modern web technologies and its potential to address the challenges faced by IELTS candidates, offering a scalable and user-friendly solution for effective exam preparation.

Existing System

This clause focuses on providing a comprehensive and detailed overview of the main business areas or functionalities of the organization or system that were briefly introduced in the previous clause. Here, the discussion is more elaborative, diving deeper into the current state of the system, its processes, and its limitations.

For the IELTS Preparation Web project, the existing system refers to the current methods and tools used by IELTS aspirants to prepare for the exam. Traditionally, IELTS preparation relies on a combination of offline coaching centers, self-study materials, and generic online resources. These methods often lack personalization, real-time feedback, and interactive learning experiences, which are crucial for effective exam preparation.

The existing system typically includes:

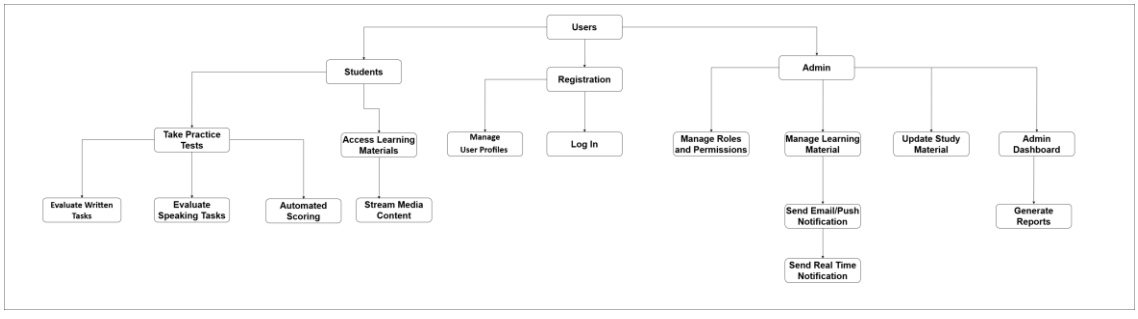
Offline Coaching Centers: These provide structured courses but are often expensive, time-consuming, and geographically limited.

Self-Study Materials: Books, PDFs, and practice tests are widely used but lack interactivity and personalized guidance.

Generic Online Platforms: Some online resources offer practice tests and study materials, but they often lack advanced features like NLP-based feedback or progress tracking.

The IELTS Preparation Web aims to address limitations by providing a modern, interactive, and intelligent platform that leverages advanced technologies like React, Python frameworks, and NLP to deliver a personalized and scalable solution for IELTS aspirants. By doing so, it seeks to revolutionize the way students prepare for the IELTS exam, making it more accessible, efficient, and effective.

Organizational Chart



Scope of the System

The Scope of the System defines the boundaries and limitations of the IELTS Preparation Web project, specifying what is included within the system This clause ensures that the project remains focused and aligned with its objectives, avoiding unnecessary expansion

or deviation from the core goals.

The IELTS Preparation Web is designed to provide a comprehensive and interactive platform for IELTS aspirants to enhance their English language skills and prepare effectively for the exam. The scope of the system includes the following key areas, which are directly aligned with the functional requirements:

User Registration and Authentication:

The system will allow users to register and create an account, providing them with access to the platform's features. It will include a secure login and logout feature, utilizing token-based authentication (e.g., JWT) to ensure user data is protected. Additionally, the system will support role-based access control, allowing different levels of access for admins, registered users, and non-registered users.

User Profile Management:

The system will store user profiles, which will include personal details, exam results, and progress history. This will enable users to track their performance over time and identify areas for improvement.

Practice Tests and Assessments:

The platform will offer non-customizable practice tests for all IELTS sections: Listening, Speaking, Reading, and Writing. Automated scoring algorithms will be implemented for objective sections like Listening and Reading, while advanced NLP models (e.g., transformers, spaCy) will be used to evaluate writing tasks based on grammar, structure, and coherence. For speaking tasks, NLP techniques will analyze pronunciation, fluency, and sentence structure, providing users with detailed feedback.

Content Management System (CMS):

The system will include a CMS that allows admins to upload, organize, and manage learning materials such as PDFs, slides, and video lectures. Admins will also have the ability to dynamically update or remove study materials based on user needs or content updates. Users will be able to access and download these materials for offline use.

Media Handling:

The platform will handle video and audio streaming for recorded lectures and speaking task evaluations, ensuring that users can access multimedia resources seamlessly.

Notifications:

The system will provide real-time notifications to users for test completions and feedback submissions. Additionally, email or push notifications will be sent to users to inform them about new materials, practice test results, and platform updates.

Admin Dashboard and Reporting:

An admin dashboard will be included to manage users, content, and monitor platform activity. Admins will also have access to detailed reporting tools to track user activity, success rates, and system performance.

Maintenance Mode:

When the platform is under maintenance, the website will display a blank page with a prominent message such as "Sorry for the disturbance, the site is currently under maintenance."

By clearly defining the scope, the IELTS Preparation Web ensures that the project remains focused on delivering a user-friendly, scalable, and intelligent platform for IELTS preparation, while avoiding unnecessary complexity or feature creep. This scope aligns with the project's goals of providing an accessible and effective solution for IELTS aspirants worldwide.

Summary of Requirements: (Initial Requirements)

The IELTS Preparation Web is designed to address the challenges faced by IELTS aspirants by providing an interactive, intelligent, and user-friendly platform for exam preparation. At a high level, the proposed system must fulfill the following requirements:

User Authentication and Authorization:

- Provide secure registration and login for users, including students and admins.
- Enable role-based access control, ensuring that users have permissions appropriate to their roles (e.g., students, admins).

Practice Tests and Assessments:

- Offer non-customizable practice tests for all IELTS sections: Listening, Speaking, Reading, and Writing.
- Implement automated scoring for objective sections (Listening and Reading).
- Use NLP models to evaluate writing tasks based on grammar, structure, and coherence.
- Apply NLP techniques for speech recognition and analysis to evaluate pronunciation, fluency, and sentence structure in speaking tasks.

User Profile and Progress Tracking:

- Store user profiles, including personal details, exam results, and progress history.
- Allow users to track their performance over time and identify areas for improvement.

Content Management System (CMS):

- Enable admins to upload, organize, and manage learning materials such as PDFs, slides, and video lectures.
- Allow admins to dynamically update or remove study materials based on user needs or content updates.
- Provide users with access to downloadable learning materials.

Media Handling:

- Handle video and audio streaming for recorded lectures and speaking task evaluations.

Notifications:

- Provide real-time notifications for test completions and feedback submissions.
- Send email or push notifications to users for new materials, practice test results, and platform updates.

Admin Dashboard and Reporting:

- Provide an admin dashboard for managing users, content, and monitoring platform activity.
- Generate detailed reports to track user activity, success rates, and system performance.

Maintenance Mode:

- Display a maintenance message (e.g., "Sorry for the disturbance, the site is currently under maintenance") when the platform is undergoing updates or fixes.

This abstract outlines the initial requirements of the system, serving as a foundation for deeper analysis and design. The IELTS Preparation Web aims to automate core processes, reduce manual errors, and provide a robust platform for efficient and effective IELTS preparation. By leveraging modern technologies like React, Python frameworks, and NLP, the system will deliver a scalable and intelligent solution for IELTS aspirants worldwide.

2.1.2. Identifying External Entities

The identification of the external entities is based on the information contained in our Abstract.

The Identification of External Entities is done in two phases.

a. Over Specify Entities from Abstract:

The identification of external entities for the IELTS Preparation Web is based on the system's scope and initial requirements. External entities interact with the system to provide inputs or receive outputs, influencing the overall functionality. These entities are classified and identified after analyzing the system's boundaries and the interactions within the domain.

Students (Users):

- Register and create accounts to access the platform.
- Take practice tests for Listening, Speaking, Reading, and Writing sections.
- Receive personalized feedback on writing and speaking tasks using NLP techniques.
- Track their progress and performance over time.
- Access and download study materials such as PDFs, slides, and video lectures.
- Receive real-time notifications for test completions, feedback submissions, and platform updates.

Admins:

- Manage user accounts, including registration and role-based access control.
- Upload, organize, and update study materials using the Content Management System (CMS).
- Monitor platform activity through the admin dashboard.
- Generate detailed reports on user activity, success rates, and system performance.
- Configure system-level settings and ensure the platform operates smoothly.
- Content Creators (Indirect Entity):

- Provide study materials such as PDFs, slides, and video lectures that are uploaded to the platform by admins.
- Ensure the quality and relevance of the content for IELTS preparation.

System Administrator:

- Configure and maintain the technical infrastructure of the system, including servers, databases, and deployment environments.
- Ensure the smooth operation of software and hardware components.
- Handle system maintenance, updates, and troubleshooting.

NLP Models (Indirect Entity):

- Provide intelligent feedback on writing tasks (grammar, structure, coherence) and speaking tasks (pronunciation, fluency, sentence structure).
- Enable automated scoring for objective sections (Listening and Reading).

By mapping these entities, we define the system's interaction landscape, establishing clear boundaries and responsibilities. This understanding ensures the accurate development and integration of functionalities to meet the system's objectives. The IELTS Preparation Web will effectively cater to the needs of students, admins, and other stakeholders, providing a seamless and efficient platform for IELTS preparation.

b. Perform Refinement:

After identifying the external entities, the next step is to refine them based on the business logic of the IELTS Preparation Web project. This refinement ensures that the entities align with the system's core functionalities and objectives. The following entities are more closely related to the business logic of the platform:

1. Students (Primary Users):

The primary users of the platform who interact with the system to prepare for the IELTS exam.

Responsibilities:

- Register and log in to access the platform.
- Take practice tests for all IELTS sections (Listening, Speaking, Reading, Writing).
- Receive real-time feedback on writing and speaking tasks using NLP models.
- Track their progress and performance through detailed reports.
- Access and download study materials such as PDFs, slides, and video lectures.
- Receive notifications for test results, new materials, and platform updates.

2. Admins (System Managers):

Responsible for managing the platform's content, users, and overall operations.

Responsibilities:

- Manage user accounts, including registration and role-based access control.
- Upload, organize, and update study materials using the Content Management System (CMS).
- Monitor platform activity through the admin dashboard.
- Generate reports on user activity, success rates, and system performance.
- Configure system settings and ensure the platform operates smoothly.

3. NLP Models (Intelligent Feedback Providers):

Provide automated and intelligent feedback on user performance.
Responsibilities:

- Evaluate writing tasks based on grammar, structure, and coherence.
- Analyze speaking tasks for pronunciation, fluency, and sentence structure.
- Enable automated scoring for objective sections (Listening and Reading).

4. Content Creators (Indirect Entity):
Provide high-quality study materials for the platform.
Responsibilities:

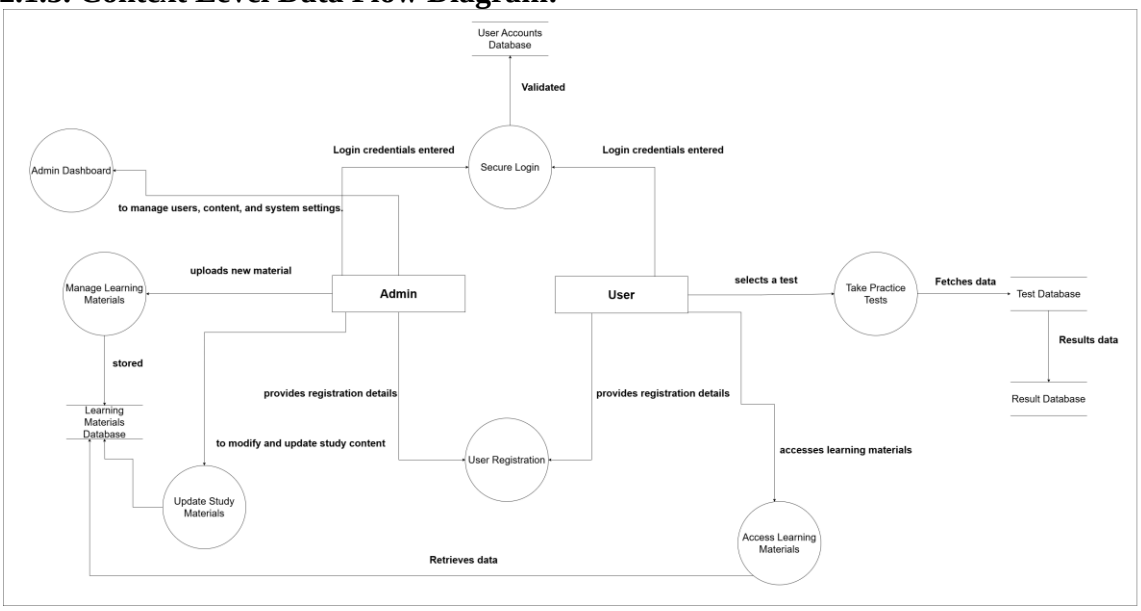
- Create and supply study materials such as PDFs, slides, and video lectures.
- Ensure the content is relevant, accurate, and aligned with IELTS preparation needs.

5. System Administrator (Technical Maintainer):
Ensure the technical stability and performance of the platform.
Responsibilities:

- Configure and maintain the system's technical infrastructure (servers, databases, etc.).
- Handle system updates, maintenance, and troubleshooting.
- Ensure the platform is secure, scalable, and performs efficiently.

By refining these entities, we ensure that the IELTS Preparation Web is aligned with its business logic, focusing on the needs of students while supporting the roles of admins, content creators, and technical maintainers. This refinement helps in designing a system that is both functional and efficient, meeting the goals of the project effectively.

2.1.3. Context Level Data Flow Diagram:



2.1.4. Capture "shall" Statements:

Para. No#	Initial Requirements

1.0	The system "shall" allow users to register and create an account.
2.0	The system "shall" provide a login and logout feature with authentication using token-based authentication (e.g., JWT).
3.0	The system "shall" support role-based access control for admins, users (registered, non-registered) using token-based authentication (e.g., JWT).
4.0	The system "shall" store user profiles, including personal details, exam results, and progress history.
5.0	The system "shall" offer non-customizable practice tests for Listening, Speaking, Reading, and Writing sections.
6.0	The system "shall" leverage pre-trained NLP models (e.g., transformers, spaCy) to evaluate writing tasks based on grammar, structure, and coherence.
7.0	The system "shall" use NLP techniques for speech recognition and analysis to evaluate pronunciation, fluency, and sentence structure in speaking tasks.
8.0	The system "shall" implement automated scoring algorithms for objective sections (Listening, Reading).
9.0	The system "shall" include a CMS for uploading and organizing learning materials such as PDFs, slides, and video lectures.
10.0	The system "shall" allow admins to dynamically update or remove study materials based on user needs or content updates.
11.0	The system "shall" allow users to access and download learning materials.
12.0	The system "shall" handle video and audio streaming for recorded lectures and speaking task evaluations.
13.0	The system "shall" provide real-time notifications for test completions and feedback submissions.
14.0	The system "shall" send email or push notifications to users for new materials, practice test results, and platform updates.
15.0	The system "shall" include an admin dashboard for managing users, content, and monitoring platform activity.
16.0	The system "shall" allow admins to use detailed reporting tools to track user activity, success rates, and system performance.

17.0	The system "shall" display a blank page with a prominent message such as "Sorry for the disturbance, the site is currently under maintenance." when it is under maintenance.

2.1.5. Allocate Requirements:

Para. No#	Initial Requirements	Use Case Name
1.0	The system "shall" allow users to register and create an account.	User Registration
2.0	The system "shall" provide a login and logout feature with authentication using token-based authentication (e.g., JWT).	Secure Login
3.0	The system "shall" support role-based access control for admins, users (registered, non-registered) using token-based authentication (e.g., JWT).	Manage Roles and Permissions
4.0	The system "shall" store user profiles, including personal details, exam results, and progress history.	Manage User Profiles
5.0	The system "shall" offer non-customizable practice tests for Listening, Speaking, Reading, and Writing sections.	Take Practice Tests
6.0	The system "shall" leverage pre-trained NLP models (e.g., transformers, spaCy) to evaluate writing tasks based on grammar, structure, and coherence.	Evaluate Writing Tasks
7.0	The system "shall" use NLP techniques for speech recognition and analysis to evaluate pronunciation, fluency, and sentence structure in speaking tasks.	Evaluate Speaking Tasks
8.0	The system "shall" implement automated scoring algorithms for objective sections (Listening, Reading).	Automated Scoring
9.0	The system "shall" include a CMS for uploading and organizing learning materials such as PDFs, slides, and video lectures.	Manage Learning Materials
10.0	The system "shall" allow admins to dynamically update or remove study materials based on user needs or content updates.	Update Study Materials

11.0	The system "shall" allow users to access and download learning materials.	Access Learning Materials
12.0	The system "shall" handle video and audio streaming for recorded lectures and speaking task evaluations.	Stream Media Content
13.0	The system "shall" provide real-time notifications for test completions and feedback submissions.	Send Real-Time Notifications
14.0	The system "shall" send email or push notifications to users for new materials, practice test results, and platform updates.	Send Email/Push Notifications
15.0	The system "shall" include an admin dashboard for managing users, content, and monitoring platform activity.	Admin Dashboard
16.0	The system "shall" allow admins to use detailed reporting tools to track user activity, success rates, and system performance.	Generate Reports
17.0	The website "shall" display a blank page with a prominent message such as "Sorry for the disturbance, the site is currently under maintenance." when it is under maintenance.	Maintenance Mode

2.1.6. Prioritize Requirements:

No.	Rank	Initial Requirements	Use Case ID	Use Case Name
1.0	Highest	The system "shall" allow users to register and create an account.	UC1	User Registration
2.0	Highest	The system "shall" provide a login and logout feature with authentication using token-based authentication (e.g., JWT).	UC2	Secure Login
3.0	Highest	The system "shall" support role-based access control for admins, users (registered, non-registered) using token-based authentication (e.g., JWT).	UC3	Manage Roles and Permissions

4.0	Medium	The system "shall" store user profiles, including personal details, exam results, and progress history.	UC4	Manage User Profiles
5.0	Highest	The system "shall" offer non-customizable practice tests for Listening, Speaking, Reading, and Writing sections.	UC5	Take Practice Tests
6.0	Highest	The system "shall" leverage pre-trained NLP models (e.g., transformers, spaCy) to evaluate writing tasks based on grammar, structure, and coherence.	UC6	Evaluate Writing Tasks
7.0	Highest	The system "shall" use NLP techniques for speech recognition and analysis to evaluate pronunciation, fluency, and sentence structure in speaking tasks.	UC7	Evaluate Speaking Tasks
8.0	Highest	The system "shall" implement automated scoring algorithms for objective sections (Listening, Reading).	UC8	Automated Scoring
9.0	Medium	The system "shall" include a CMS for uploading and organizing learning materials such as PDFs, slides, and video lectures.	UC9	Manage Learning Materials
10.0	Medium	The system "shall" allow admins to dynamically update or remove study materials based on user needs or content updates.	UC10	Update Study Materials
11.0	Medium	The system "shall" allow users to access and download learning materials.	UC11	Access Learning Materials
12.0	Medium	The system "shall" handle video and audio streaming for recorded lectures and speaking task evaluations.	UC12	Stream Media Content
13.0	Medium	The system "shall" provide real-time notifications for test completions and feedback submissions.	UC13	Send Real-Time Notifications

14.0	Medium	The system "shall" send email or push notifications to users for new materials, practice test results, and platform updates.	UC14	Send Email/Push Notifications
15.0	Highest	The system "shall" include an admin dashboard for managing users, content, and monitoring platform activity.	UC15	Admin Dashboard
16.0	Medium	The system "shall" allow admins to use detailed reporting tools to track user activity, success rates, and system performance.	UC16	Generate Reports
17.0	Lowest	The website "shall" display a blank page with a prominent message such as "Sorry for the disturbance, the site is currently under maintenance." when it is under maintenance.	UC17	Maintenance Mode

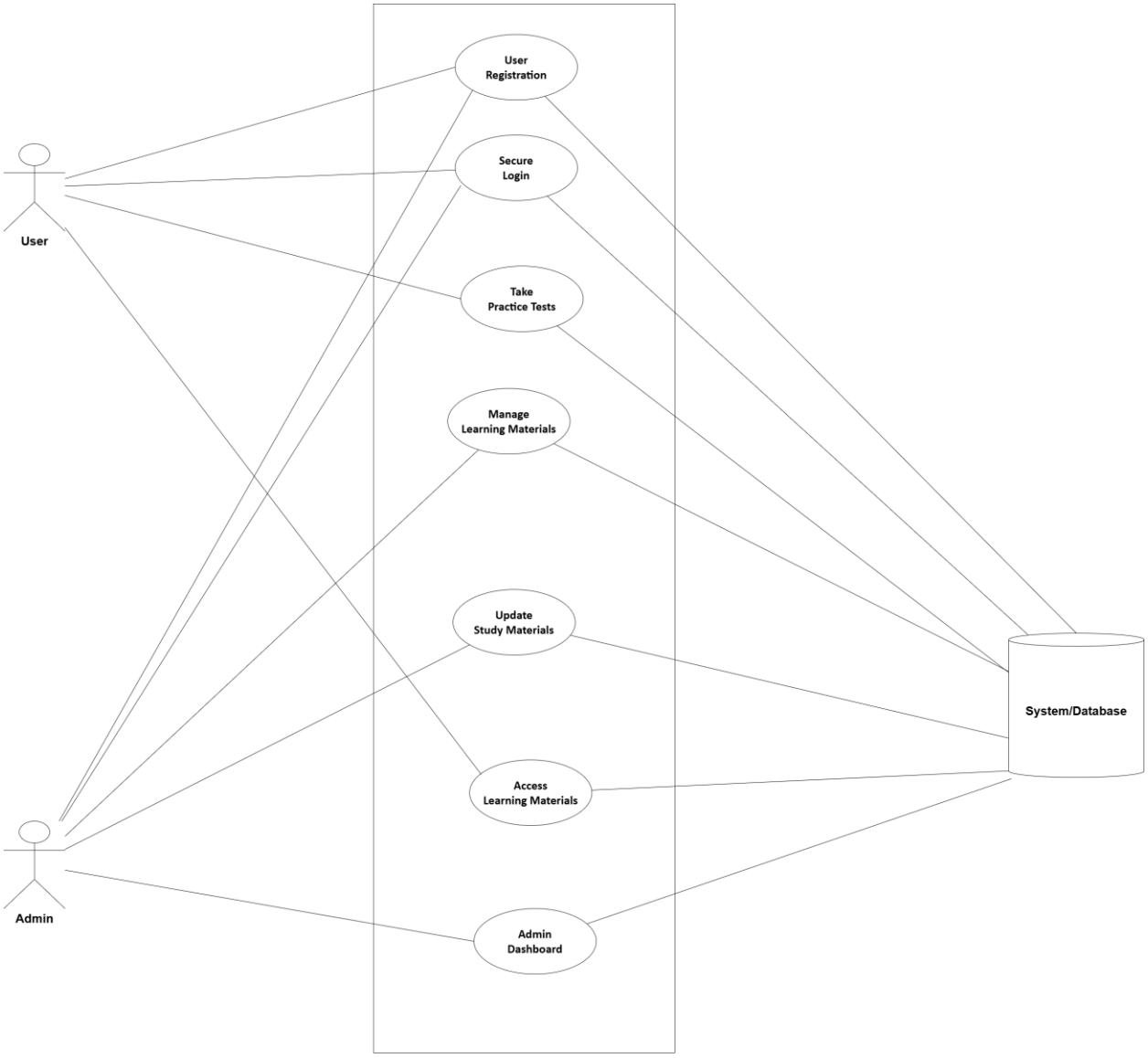
2.1.7. Requirements Trace-ability Matrix:

No.	ID	System Specification Text	Build	Use Case Name	Category
1	1.0	The system "shall" allow users to register and create an account.	B1	User Registration	Mandatory
2	2.0	The system "shall" provide a login and logout feature with authentication using token-based authentication (e.g., JWT).	B2	Secure Login	Mandatory
3	3.0	The system "shall" support role-based access control for admins, users (registered, non-registered) using token-based authentication (e.g., JWT).	B3	Manage Roles and Permissions	Mandatory
4	4.0	The system "shall" store user profiles, including personal details, exam results, and progress history.	B4	Manage User Profiles	Should Have

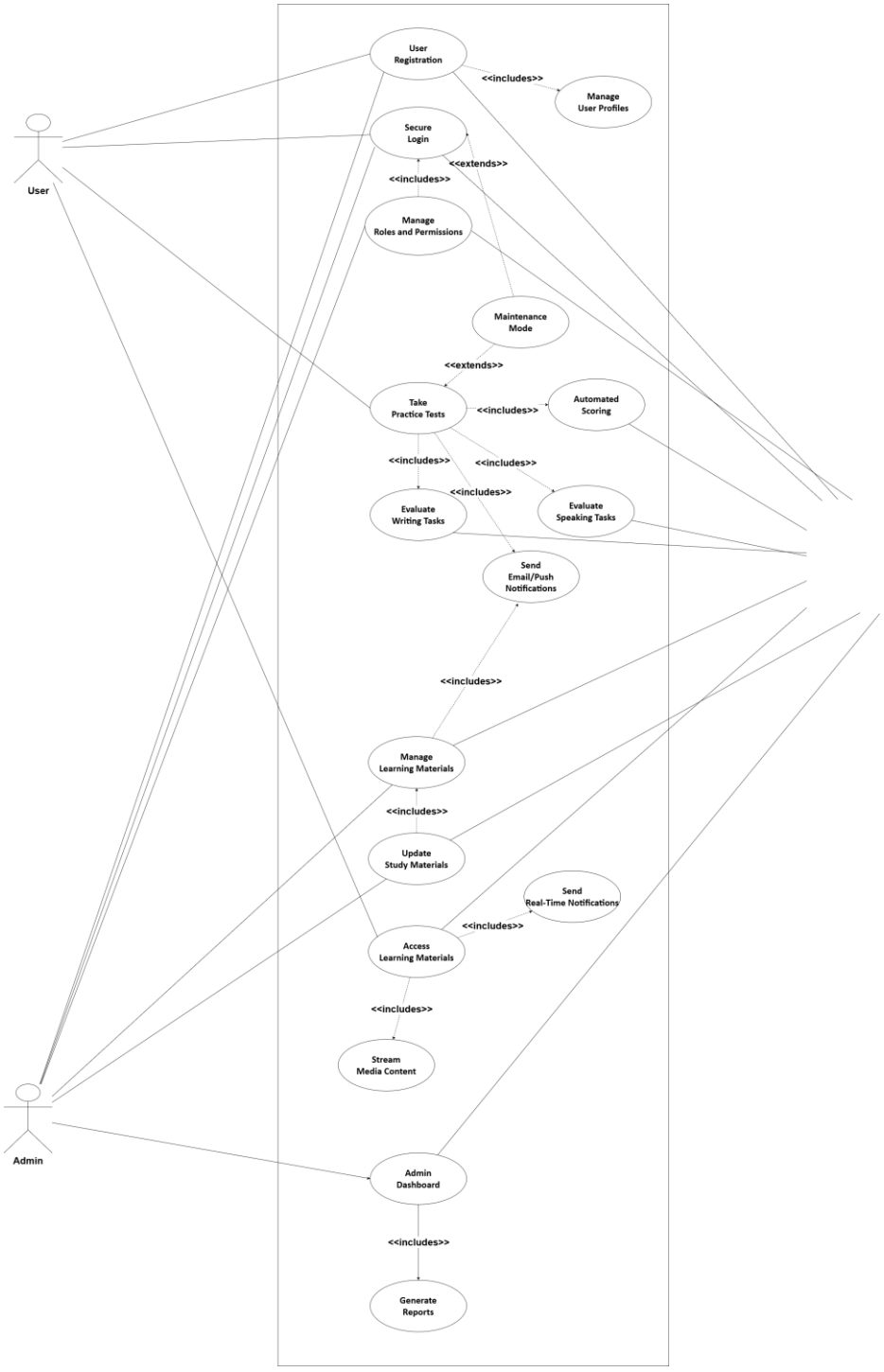
5	5.0	The system "shall" offer non-customizable practice tests for Listening, Speaking, Reading, and Writing sections.	B5	Take Practice Tests	Mandatory
6	6.0	The system "shall" leverage pre-trained NLP models (e.g., transformers, spaCy) to evaluate writing tasks based on grammar, structure, and coherence.	B6	Evaluate Writing Tasks	Mandatory
7	7.0	The system "shall" use NLP techniques for speech recognition and analysis to evaluate pronunciation, fluency, and sentence structure in speaking tasks.	B7	Evaluate Speaking Tasks	Mandatory
8	8.0	The system "shall" implement automated scoring algorithms for objective sections (Listening, Reading).	B8	Automated Scoring	Mandatory
9	9.0	The system "shall" include a CMS for uploading and organizing learning materials such as PDFs, slides, and video lectures.	B9	Manage Learning Materials	Should Have
10	10.0	The system "shall" allow admins to dynamically update or remove study materials based on user needs or content updates.	B10	Update Study Materials	Should Have
11	11.0	The system "shall" allow users to access and download learning materials.	B11	Access Learning Materials	Should Have
12	12.0	The system "shall" handle video and audio streaming for recorded lectures and speaking task evaluations.	B12	Stream Media Content	Should Have
13	13.0	The system "shall" provide real-time notifications for test completions and feedback submissions.	B13	Send Real-Time Notifications	Should Have

14	14.0	The system "shall" send email or push notifications to users for new materials, practice test results, and platform updates.	B14	Send Email/Push Notifications	Should Have
15	15.0	The system "shall" include an admin dashboard for managing users, content, and monitoring platform activity.	B15	Admin Dashboard	Mandatory
16	16.0	The system "shall" allow admins to use detailed reporting tools to track user activity, success rates, and system performance.	B16	Generate Reports	Good To Have
17	17.0	The website "shall" display a blank page with a prominent message such as "Sorry for the disturbance, the site is currently under maintenance." when it is under maintenance.	B17	Maintenance Mode	Good To Have

2.1.8. High Level Usecase Diagram:



2.1.9. Analysis Level Usecase Diagram:



2.1.10. Usecase Description

UC1 - User Registration

Field	Details
Use Case ID	UC_1
Use Case Name	User Registration
Actor	User
Brief Description	New users register an account in the system.
Type	Primary
Dependency	None
Precondition	User is not already registered.
Post-condition	User account is created.
Basic Flow	- User selects "Register" - System displays registration form - User enters required details - System validates input - If valid, system creates an account and sends verification email - User verifies email - System activates account and redirects to login page
Alternative Flow	- User enters an already registered email - System displays an error message

UC2 - Secure Login

Field	Details
Use Case ID	UC_2

Use Case Name	Secure Login
Actor	User
Brief Description	Users log into the system securely.
Type	Primary
Dependency	None
Precondition	User is registered.
Post-condition	User is logged in.
Basic Flow	- User enters credentials - System verifies credentials - If correct, system generates a session/token and redirects to dashboard
Alternative Flow	- User enters incorrect credentials - System displays an error message - **System is under maintenance** - System displays a maintenance message and prevents login

UC3 - Take Practice Tests

Field	**Details**
Use Case ID	UC_3
Use Case Name	Take Practice Tests
Actor	User
Brief Description	Users take online practice tests.
Type	Primary
Dependency	Secure Login
Precondition	User is logged in.

Post-condition	Test is completed and scored.
Basic Flow	- User selects a test - System displays questions with a timer - User completes test sections - Submits test - System evaluates responses - System generates and displays scores
Alternative Flow	- **System is under maintenance** - System prevents test access and displays a maintenance message

UC4 - Manage Learning Materials

Field	**Details**
Use Case ID	UC_4
Use Case Name	Manage Learning Materials
Actor	Admin
Brief Description	Admin uploads and manages study materials.
Type	Primary
Dependency	Secure Login
Precondition	Admin is logged in.
Post-condition	Study materials are updated.
Basic Flow	- Admin navigates to "Learning Materials" - Selects "Upload New Material" - Uploads and categorizes material - System validates and saves the file - System notifies users about new material
Alternative Flow	- Admin uploads an invalid file - System rejects file and displays an error

UC5 - Update Study Materials

Field	Details
Use Case ID	UC_5
Use Case Name	Update Study Materials
Actor	Admin
Brief Description	Admin updates existing study materials.
Type	Primary
Dependency	Manage Learning Materials (UC9)
Precondition	Admin is logged in.
Post-condition	Study materials are updated.
Basic Flow	- Admin navigates to "Learning Materials" - Selects an existing material - Clicks "Edit" - Updates content or uploads a new file - System validates and saves changes - System notifies users about the update
Alternative Flow	- Admin selects a non-existent material - System displays an error message

UC6 - Access Learning Materials

Field	Details
Use Case ID	UC_6
Use Case Name	Access Learning Materials
Actor	User

Brief Description	Users access and download study materials.
Type	Primary
Dependency	Secure Login
Precondition	User is logged in.
Post-condition	Learning material is accessed.
Basic Flow	- User selects "Learning Materials" - System displays available resources - User selects a file - System provides file for download
Alternative Flow	- Requested material is unavailable - System displays an error

UC7 - Admin Dashboard

Field	Details
Use Case ID	UC_7
Use Case Name	Admin Dashboard
Actor	Admin
Brief Description	Admin manages users, content, and platform settings.
Type	Primary
Dependency	Secure Login
Precondition	Admin is logged in.
Post-condition	Dashboard actions are completed.

Basic Flow	- Admin logs in - System verifies admin privileges - System displays the Admin Dashboard - Admin manages users, roles, content, and reports - Admin can update platform settings
Alternative Flow	- Unauthorized access attempt - System redirects to login page

Chapter 3: Design Document (For Object Oriented Approach)

3.1. Introduction:

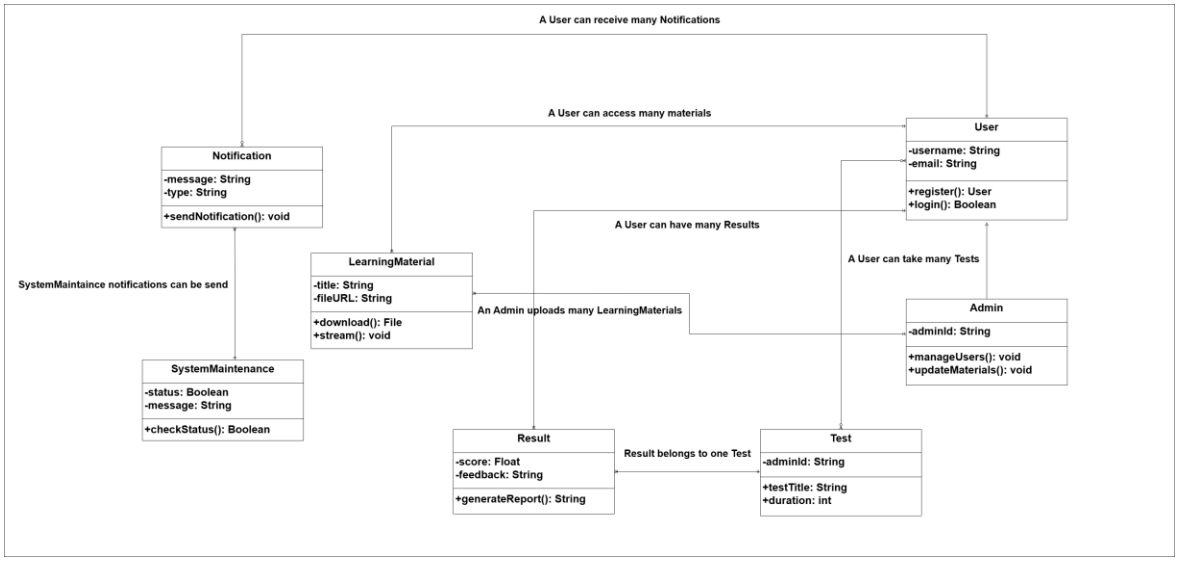
The third deliverable of the IELTS Preparation Web project focuses on software design, transitioning from problem analysis to solution implementation using an object-oriented approach. In the previous phase, we completed a thorough system analysis, allowing us to understand the current challenges in IELTS exam preparation and define clear functional and non-functional requirements.

Now, we move toward designing a robust solution that addresses these challenges by leveraging object-oriented principles (OOP). Following artifacts are included in the 3rd deliverable.

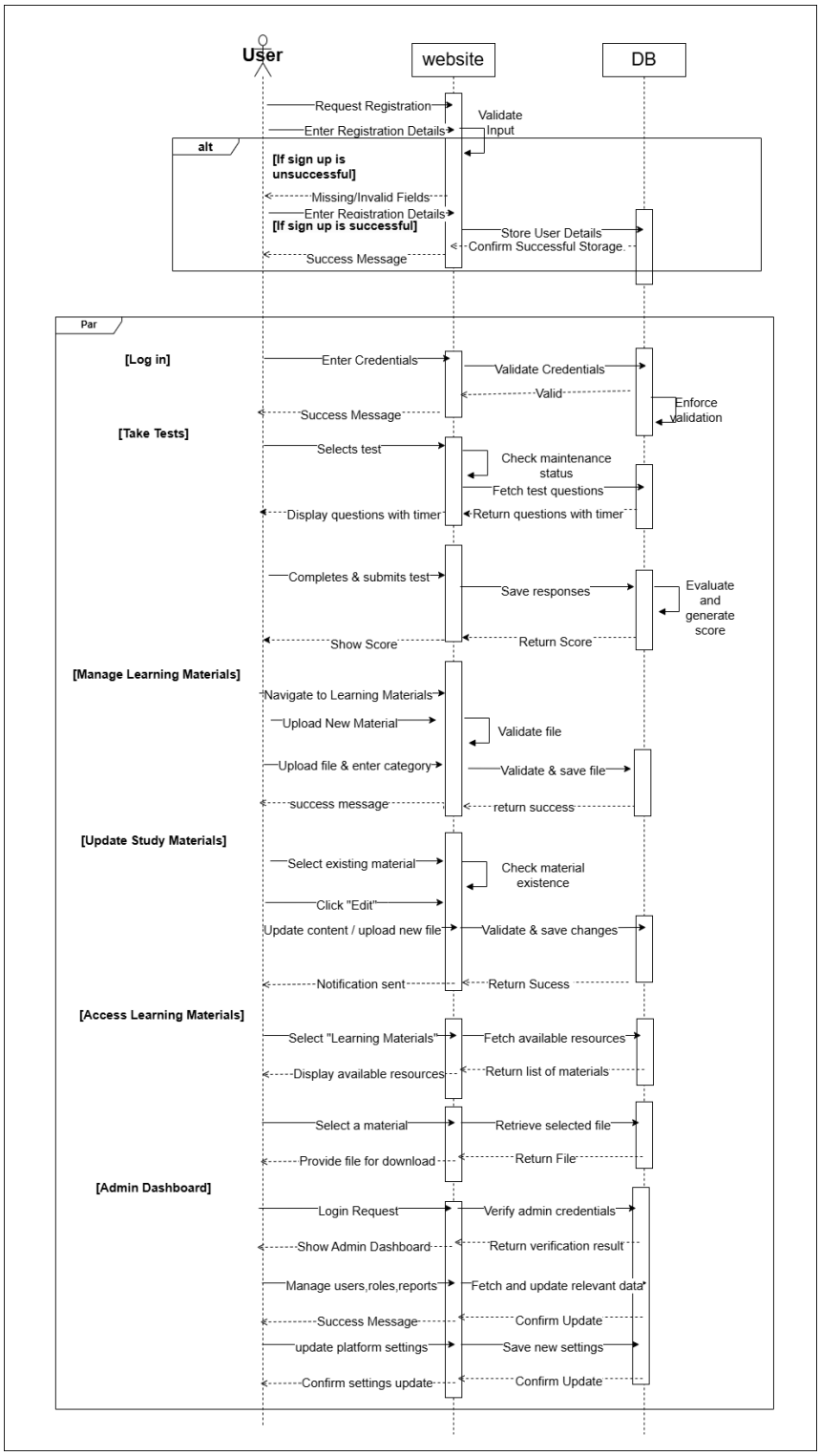
1. Domain Model
2. System Sequence Diagram
3. Sequence Diagram
4. Collaboration Diagram
5. Operation Contracts
6. Design Class Diagram
7. State Transition Diagram
8. Data Model

Now we discuss these artifacts one by one as follows:

3.2. Domain Model

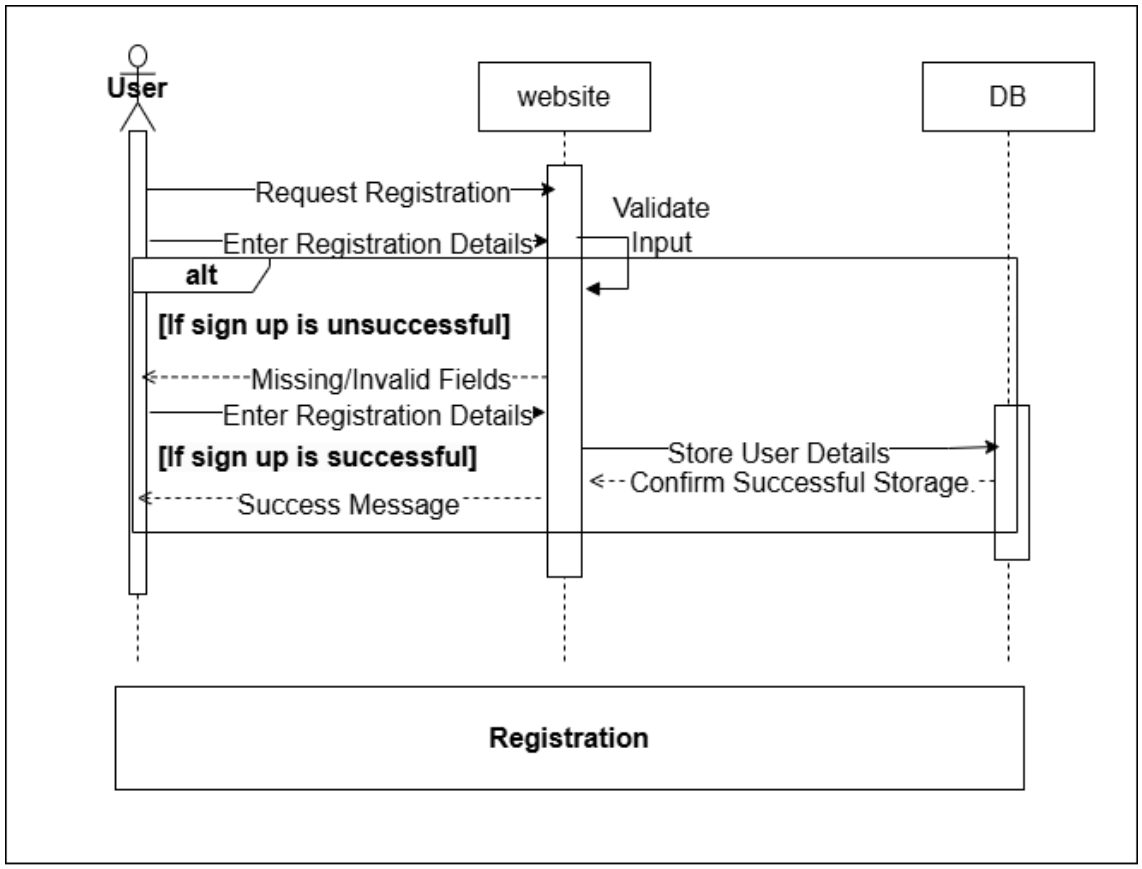


3.3. System Sequence Diagram

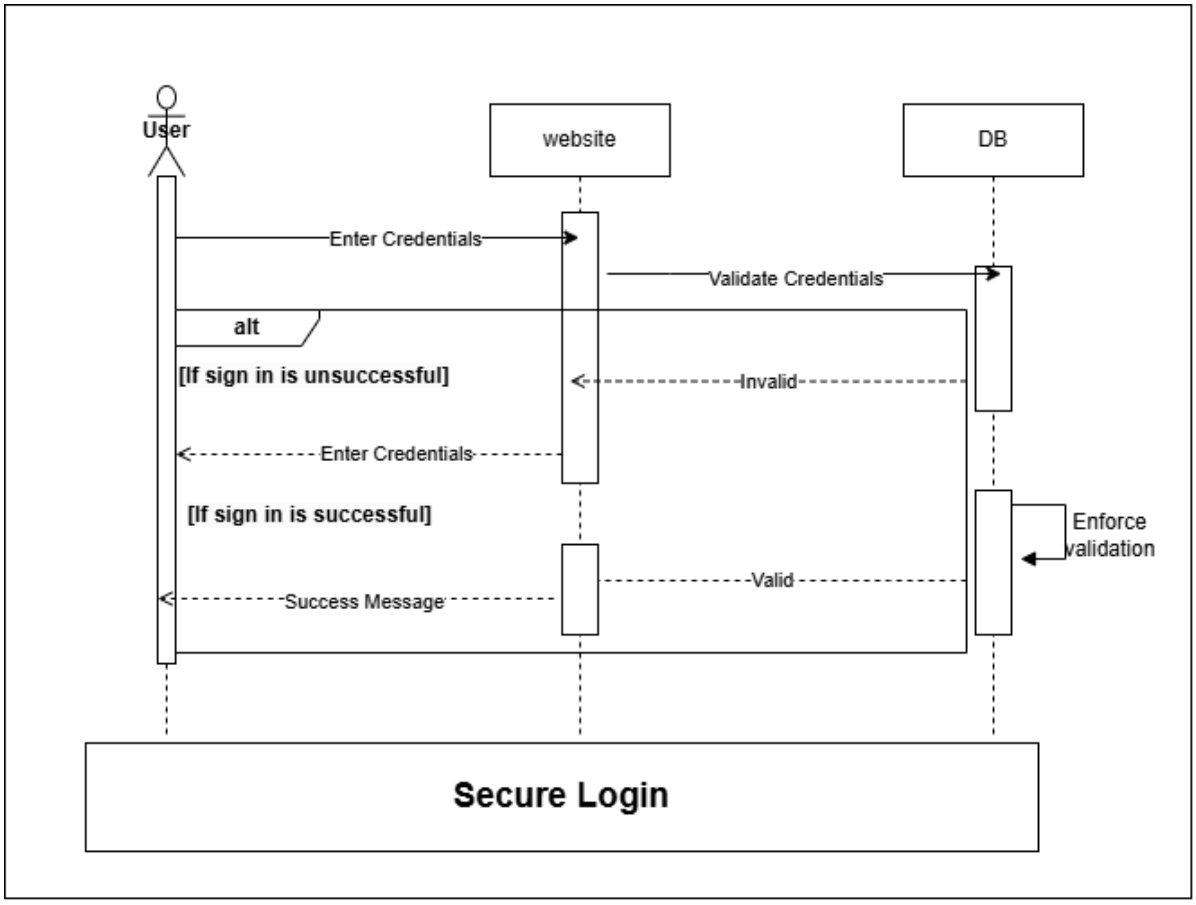


3.4. Sequence Diagram

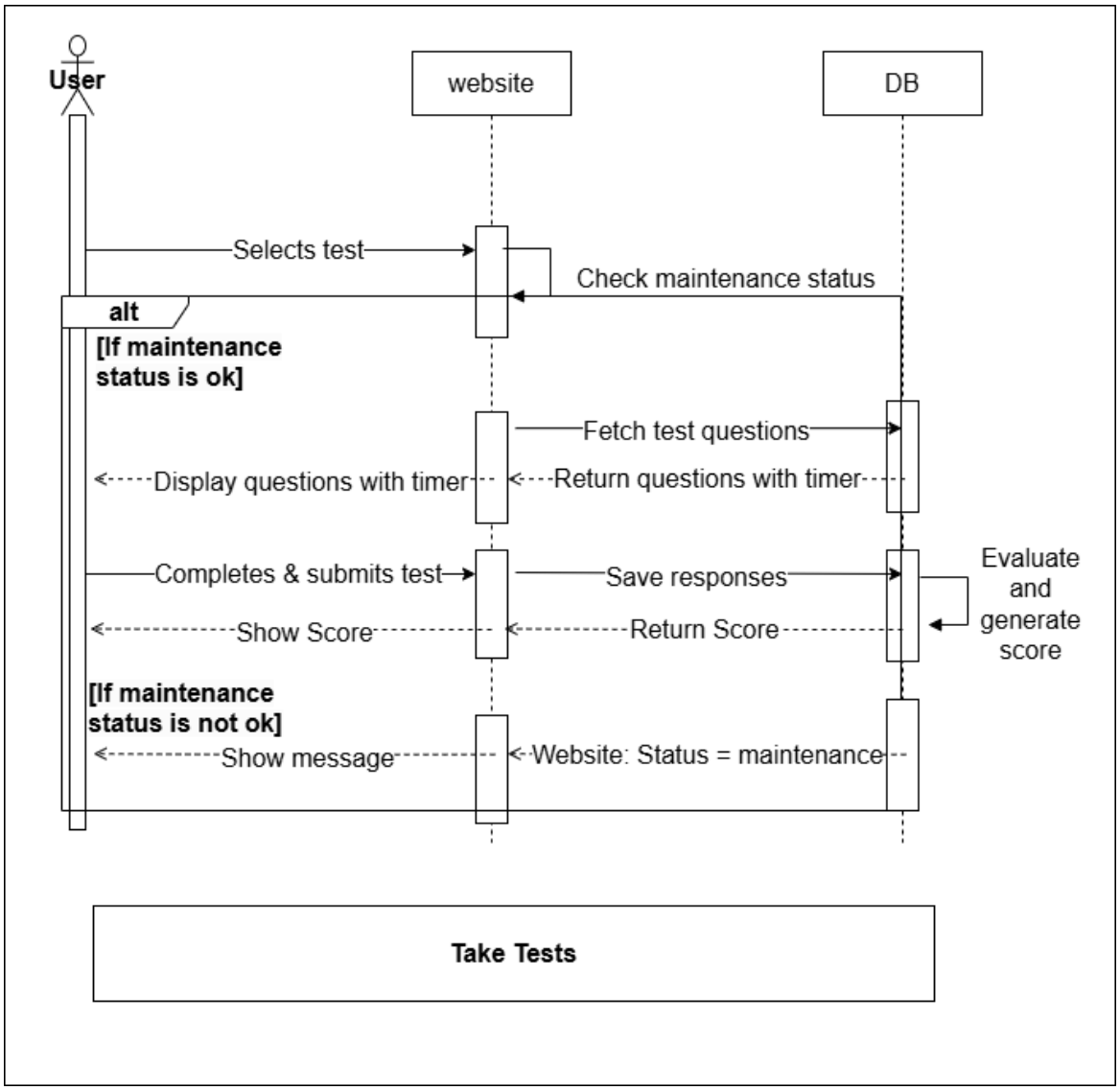
Registration Sequence:



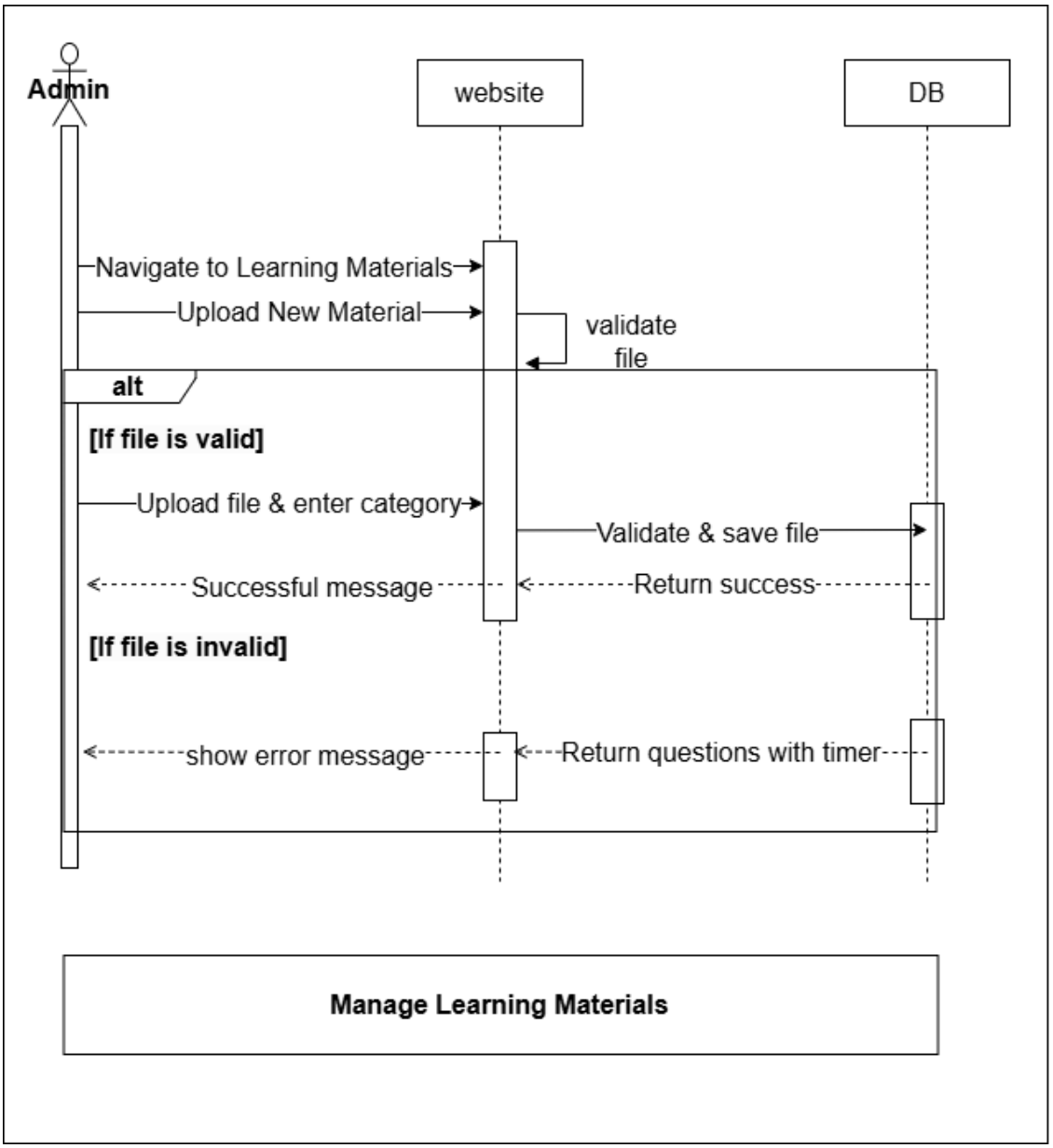
Login Sequence:



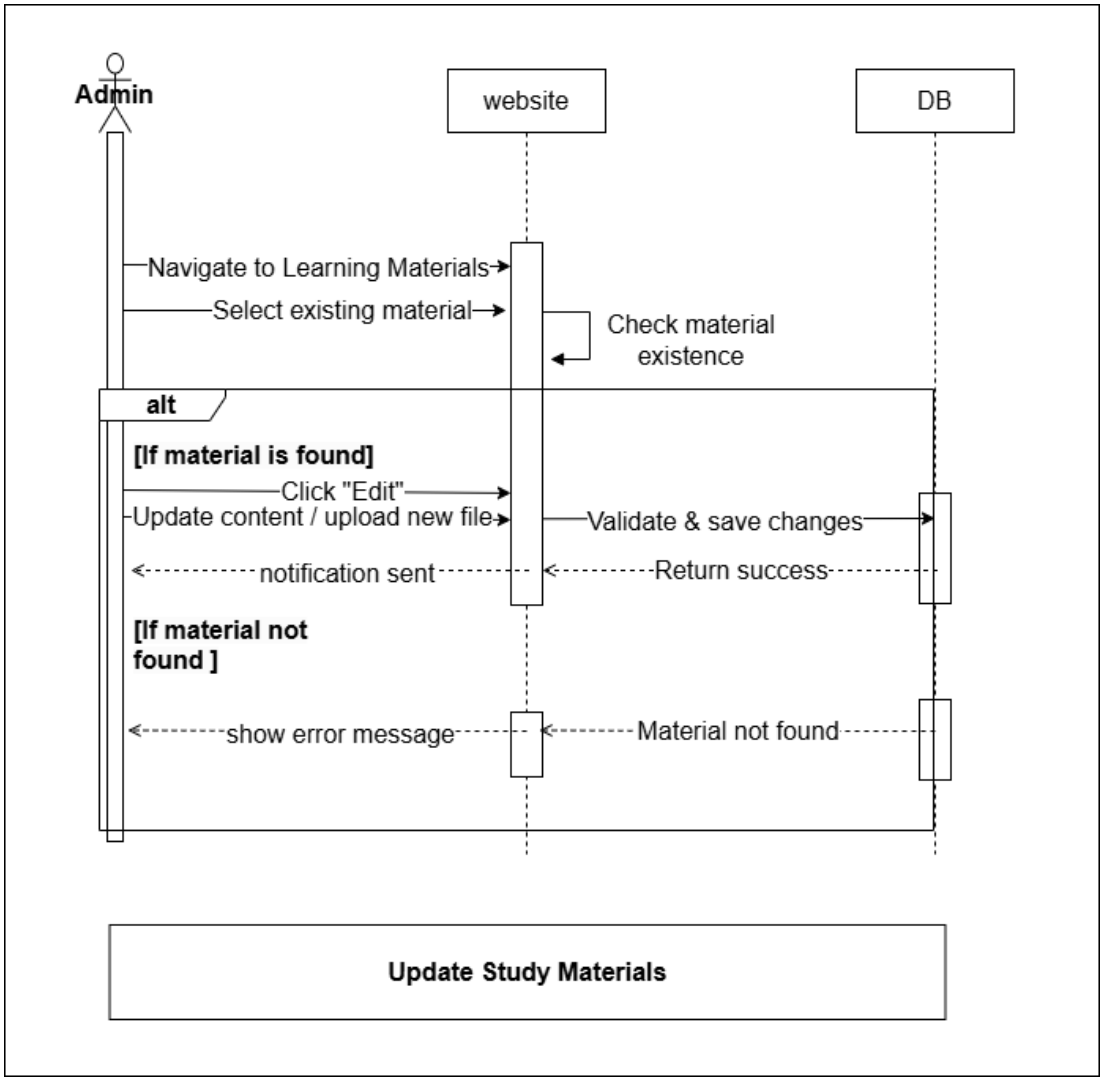
Take Tests Sequence:



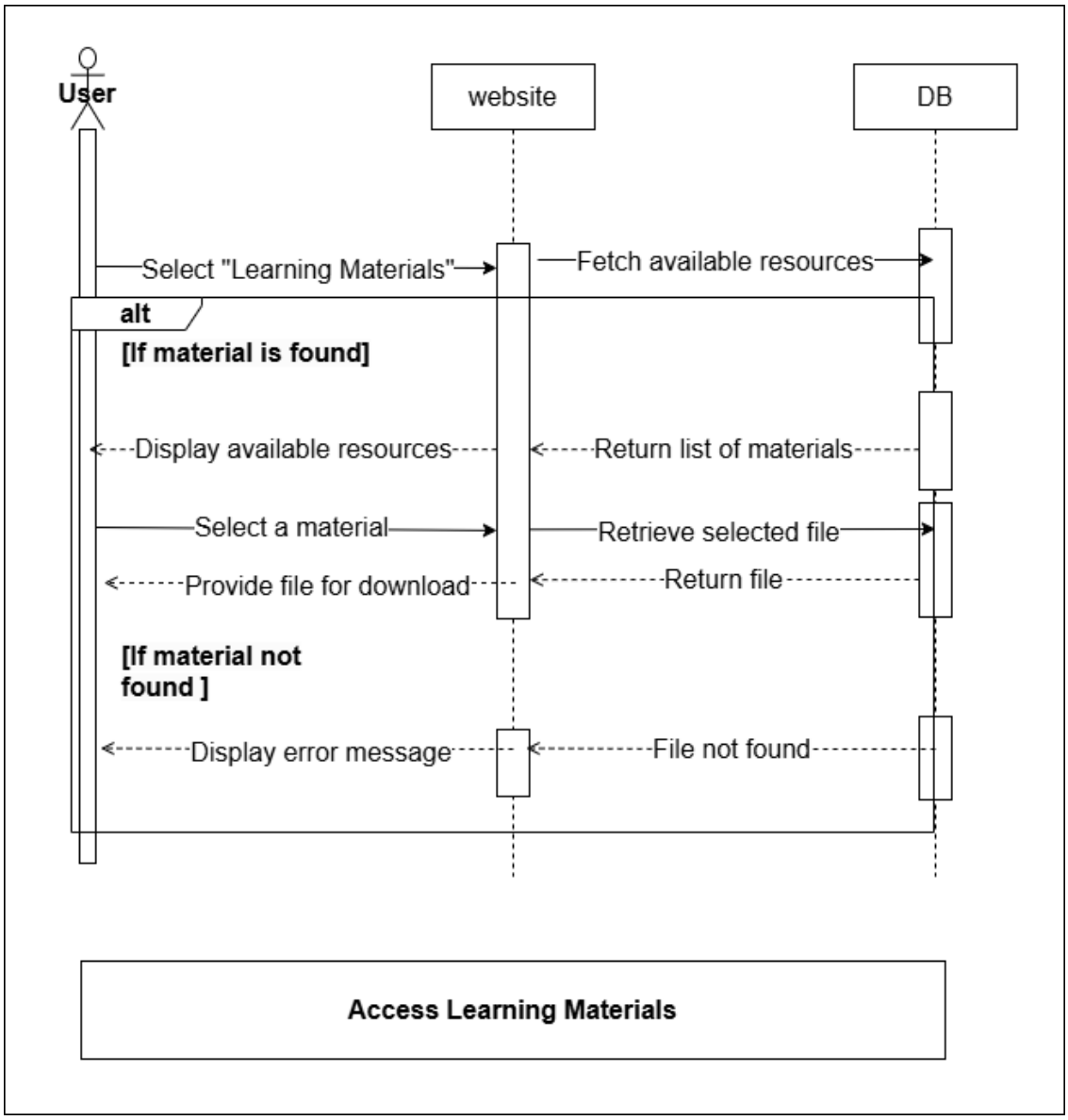
Manage Learning Material Sequence:



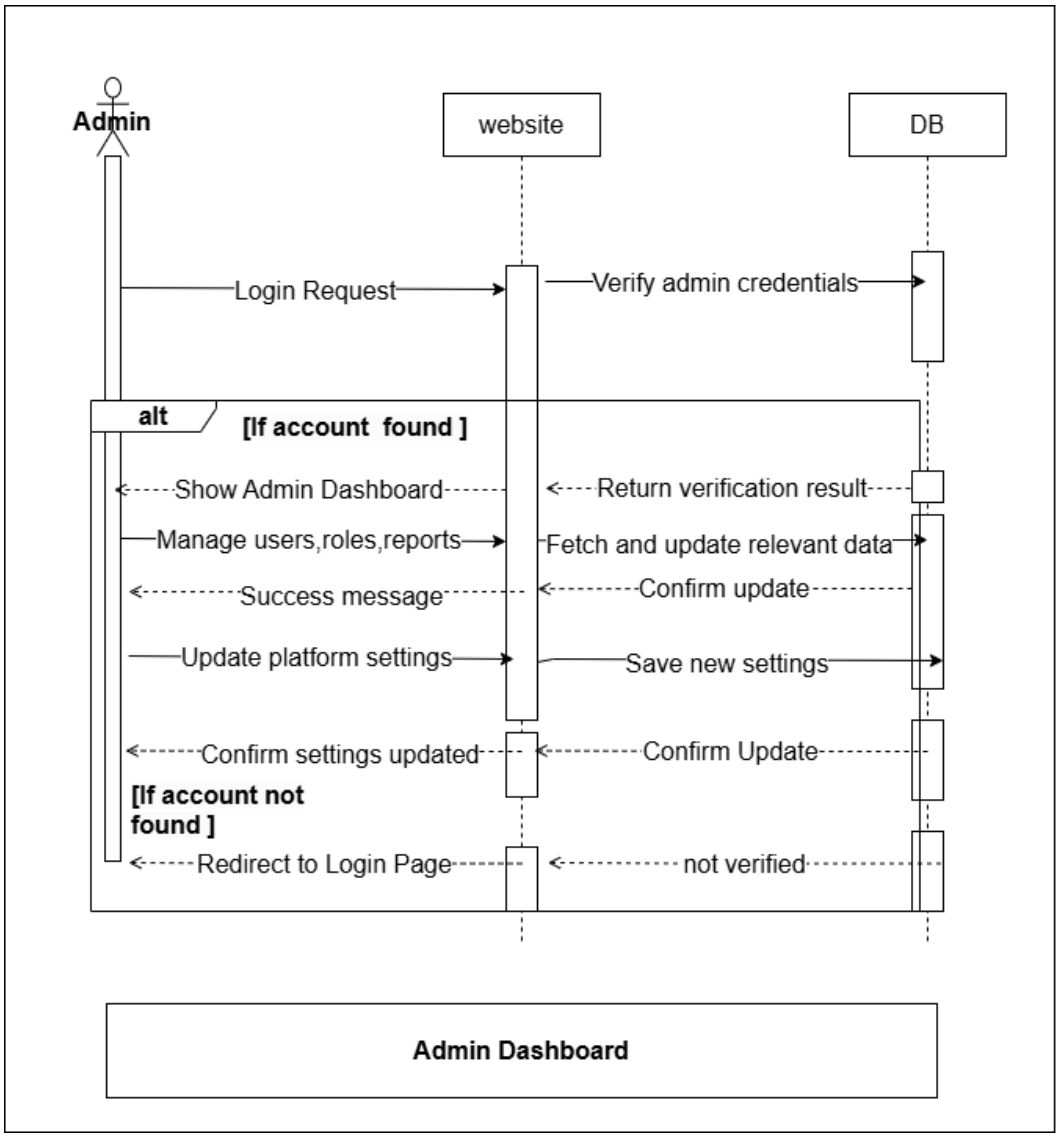
Update Study Material Sequence:



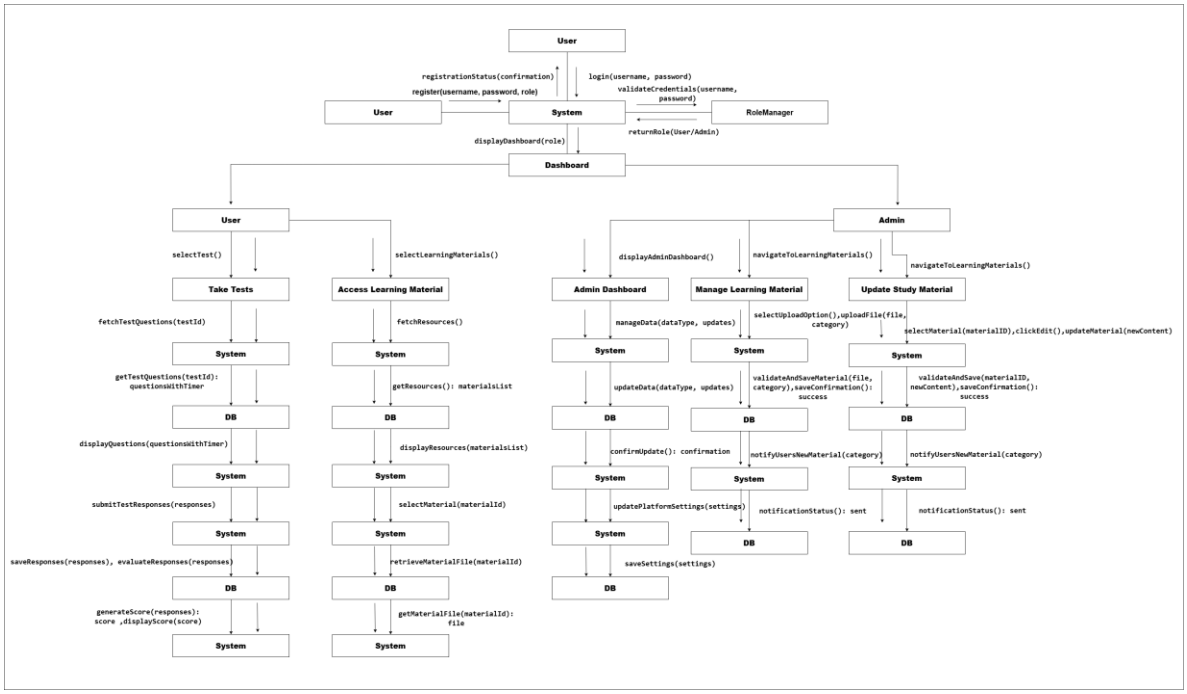
Access Learning Material Sequence:



Admin Dashboard:



3.5. Collaboration Diagram



3.6. Operation Contracts

Name	**User Registration()**
Responsibilities	Allow new users to register by providing necessary details.
Cross References	UC_1 User Registration
Expectations	A new user account is created and activated upon email verification.
Pre Conditions	User is not already registered.
Post Conditions	User account is created and ready for login.

Name	**SecureLogin()**
Responsibilities	Allow users to securely log in to the platform.
Cross References	UC_2 Secure Login
Expectations	Users are securely authenticated and redirected to dashboard.

Pre Conditions	User is already registered.
Post Conditions	User is successfully logged in.

Name	**TakePracticeTest()**
Responsibilities	Provide users with practice tests and score their responses.
Cross References	UC_3 Take Practice Tests
Expectations	Test is submitted, evaluated, and scored.
Pre Conditions	User is logged in.
Post Conditions	User receives test results.

Name	**ManageLearningMaterials()**
Responsibilities	Allow admin to upload and manage study materials.
Cross References	UC_4 Manage Learning Materials
Expectations	Valid materials are added to the platform and users are notified.
Pre Conditions	Admin is logged in.
Post Conditions	New materials are added to the system.

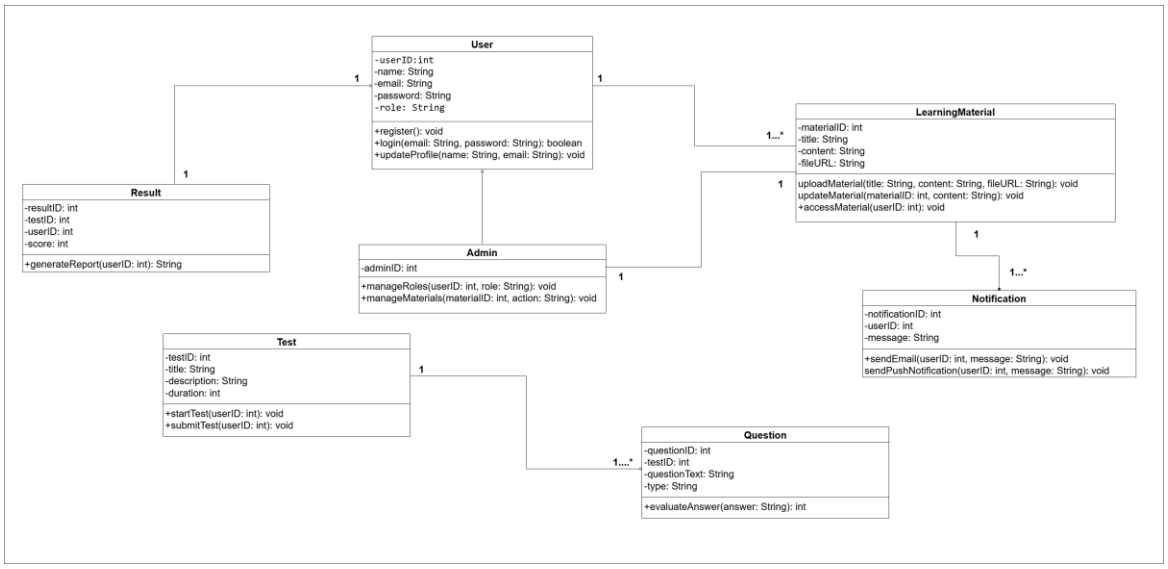
Name	**UpdateStudyMaterials()**
Responsibilities	Enable admin to modify or replace existing learning materials.
Cross References	UC_5 Update Study Materials
Expectations	Existing materials are updated and users are notified.
Pre Conditions	Admin is logged in and materials exist in the system.
Post Conditions	Materials are updated and changes reflected in the system.

Name	**AccessLearningMaterials()**
Responsibilities	Allow users to browse and download available study materials.

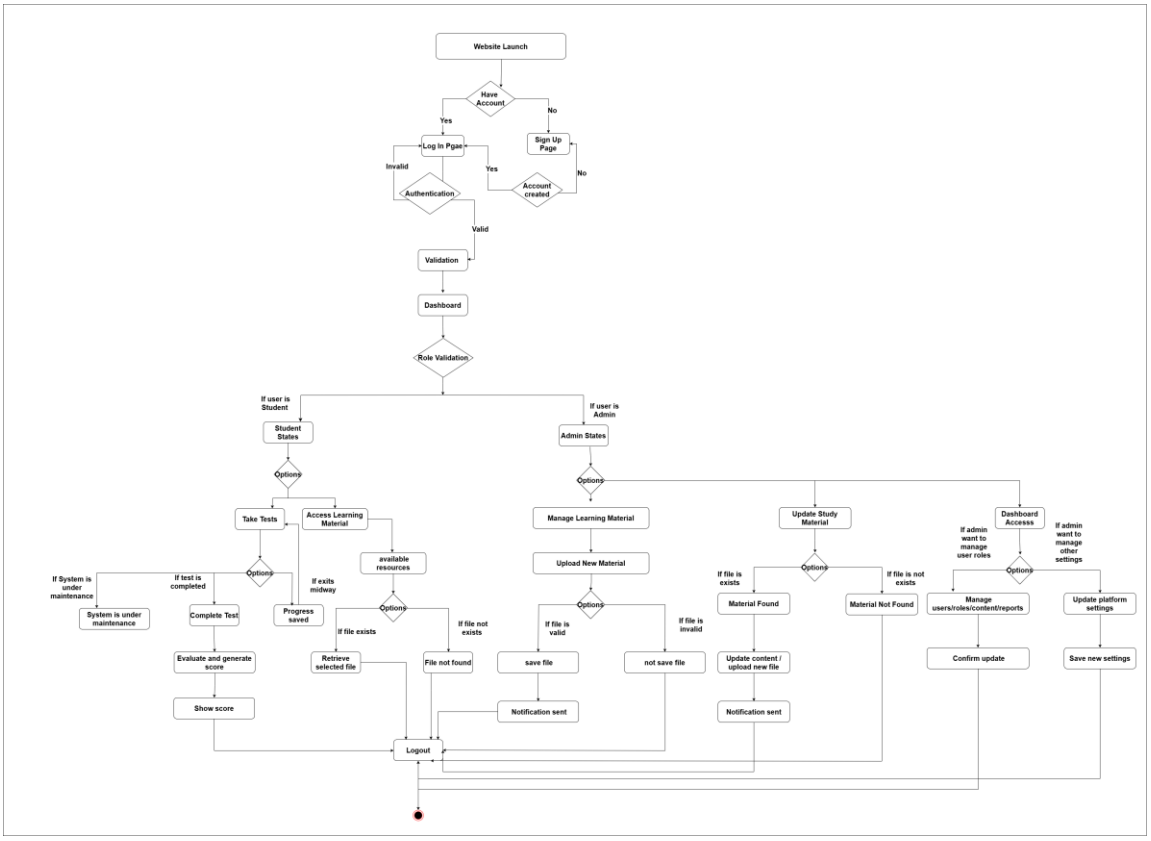
Cross References	UC_6 Access Learning Materials
Expectations	Users are able to view and download valid learning resources.
Pre Conditions	User is logged in.
Post Conditions	Requested file is accessed and downloaded.

Name	**AdminDashboard()**
Responsibilities	Provide admin a centralized interface for managing users, materials, and settings.
Cross References	UC_7 Admin Dashboard
Expectations	Admin successfully performs management operations and updates settings.
Pre Conditions	Admin is logged in and has privileges.
Post Conditions	Admin activities are completed and reflected in the system.

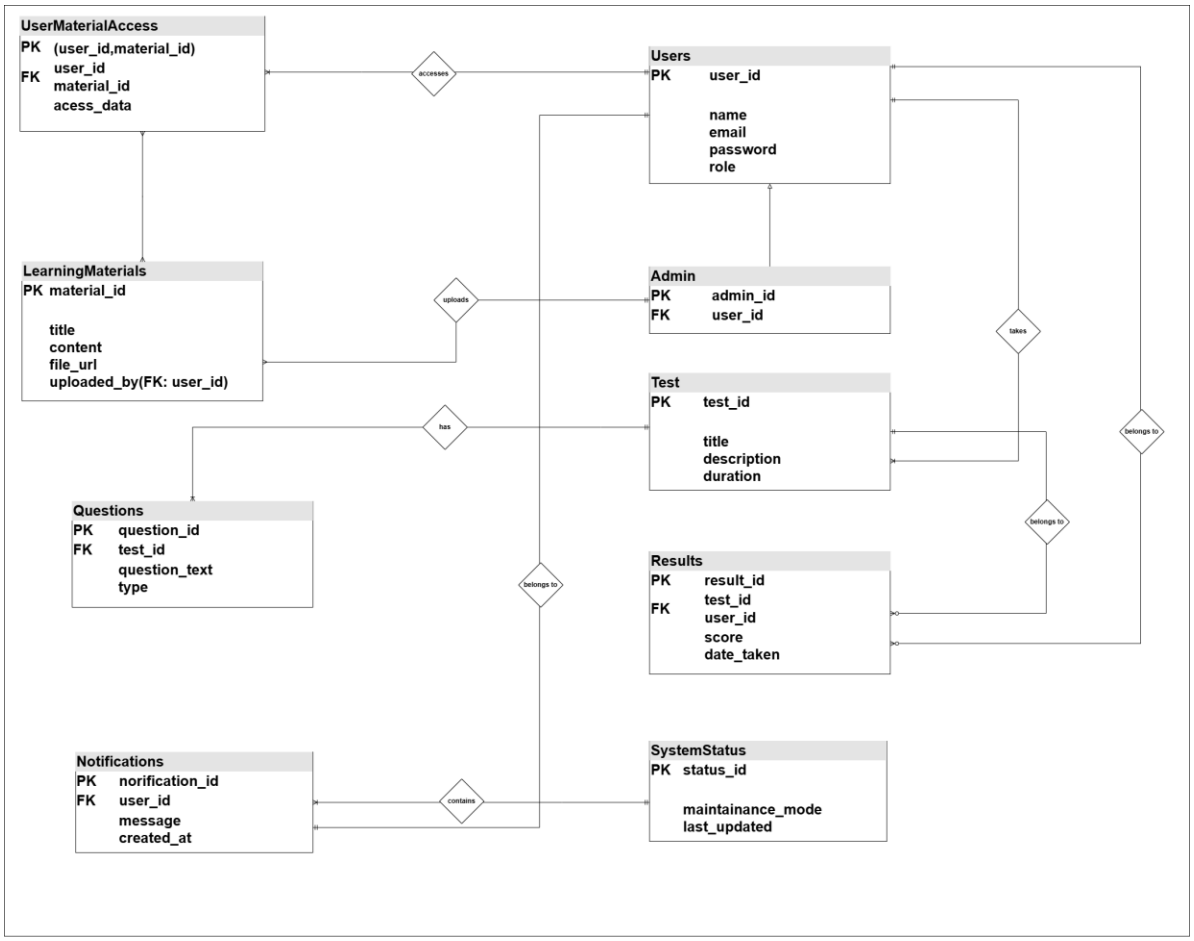
3.7. Design Class Diagram



3.8. State chart diagram



3.9. Data Model

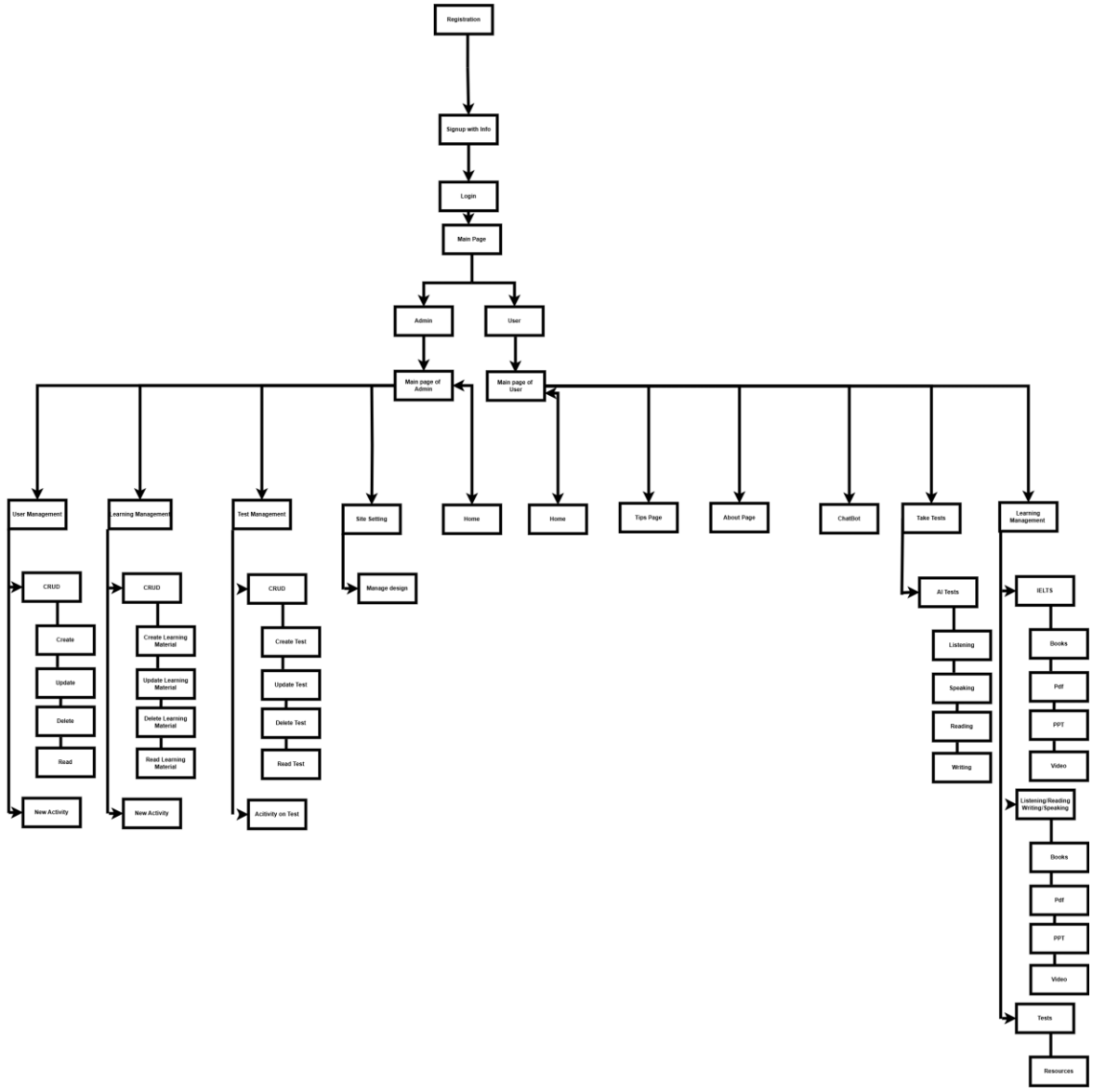


Chapter 4: User Interface Design

4.1. Introduction

This chapter introduces the design framework for the IELTS Preparation Web, focusing on creating an intuitive and accessible learning platform. This chapter details the structured approach to UI development, beginning with site maps to outline the hierarchical organization of key modules like Practice Tests and Progress Tracking. Storyboards and navigational maps are employed to visualize user interactions, ensuring seamless transitions between tasks such as test submissions and feedback reviews. Wireframes translate these flows into tangible layouts, while a traceability matrix guarantees alignment with functional requirements, particularly for NLP-powered feedback systems. The design prioritizes consistency with uniform styling, accessibility through WCAG 2.1 compliance, and engagement via interactive elements like progress trackers and timed practice tests. By integrating these tools, the interface effectively bridges technical functionality with learner-centric usability, creating an optimized experience for IELTS aspirants that is both educationally effective and technically robust.

4.2. Site Maps



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4.3. Story boards

1. Registration Page Storyboard:

- **Header**:
  - Platform logo on the left.
  - Navigation: Home | Login | Help on the right.
- **Registration Form**:
  - Fields: Full Name, Email, Password, Confirm Password.
  - Checkbox for agreeing to Terms and Conditions.
  - "Register" button at the bottom.

- **Side Panel** (optional):
    - "Why Join Us?" – benefits of registering (practice tests, learning materials).
- **Footer**:
    - Links: About Us | Privacy Policy | Contact Us.

2. Login Page Storyboard:

- **Header**:
    - Platform logo.
    - Navigation links: Home | Register | Help.
- **Login Form**:
    - Fields: Email, Password.
    - "Login" button.
    - Link: "Forgot Password?" below form.
- **Security Notice**:
    - Text: "Secure login with encryption."
- **Footer**:
    - Same links as the registration page.

3. Practice Tests Page Storyboard:

- **Header**:
    - Navigation: Dashboard | Practice Tests | Learning Materials | Logout.
- **Test Listings**:
    - Available tests shown as cards (title, short description, difficulty).
    - "Start Test" button on each card.
- **Search and Filter Panel**:
    - Search bar for specific tests.
    - Filters for Category and Difficulty.
- **During Test**:
    - Timer on top right.
    - Question area in the middle.
    - Navigation buttons: Next, Previous.
    - Submit Test button.
- **After Test**:
    - Display of scores, correct/incorrect answers, and detailed analysis.

4. Learning Materials Page Storyboard:

- **Header**:
    - Navigation: Dashboard | Practice Tests | Learning Materials | Logout.
- **Materials Library**:
    - Grid/List view of materials (Name, Short Description, Download Link).
- **Filters**:
    - Filter by Subject, Date Added.
- **Admin Controls** (only visible for Admins):
    - "Upload New Material" button.
- **Upload Form (Admin)**:

- Fields: Title, Description, Upload File, Category.

5. Admin Dashboard Storyboard:

- **Header**:
  - Navigation: Admin Dashboard | Manage Users | Upload Material | Reports | Logout.
- **Overview Panel**:
  - Summary cards:
    - Total Users
    - Total Practice Tests
    - Total Learning Materials
- **Manage Users**:
  - Table with User Info: Name, Email, Role (Admin/User), Status (Active/Blocked).
  - Options to Block/Unblock users.
- **Upload/Manage Materials**:
  - Button to upload new learning materials.
  - List of uploaded materials with Edit/Delete options.
- **Reports Section**:
  - Charts showing user activity and test statistics.

6. User Dashboard Storyboard:

- **Header**:
  - Navigation: Dashboard | Practice Tests | Learning Materials | Profile | Logout.
- **Welcome Message**:
  - "Welcome, [User Name]!" banner.
- **Quick Actions**:
  - Start New Practice Test
  - View Past Test Results
  - Download Learning Materials
- **User Progress Overview**:
  - Small graph showing completed tests and downloaded materials.

7. Profile Page Storyboard:

- **Profile Info Section**:
  - Display: Name, Email, Role.
  - "Edit Profile" button to update information.
- **Change Password Section**:
  - Fields for Old Password, New Password, Confirm New Password.
  - Save Changes button.
- **Test History**:
  - List of past practice tests and results.

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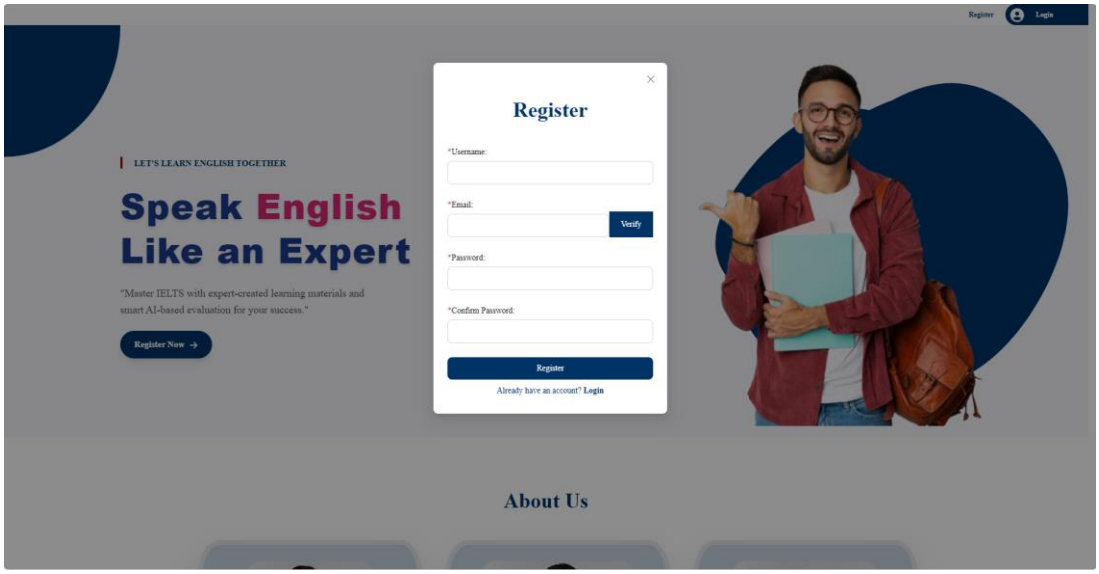
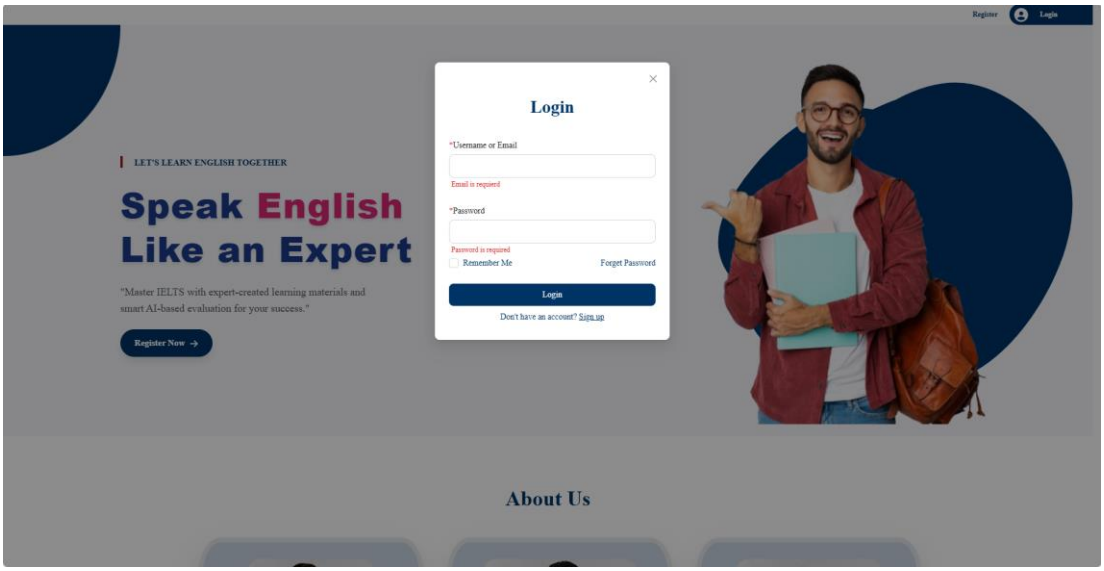
4.4. Navigational maps:

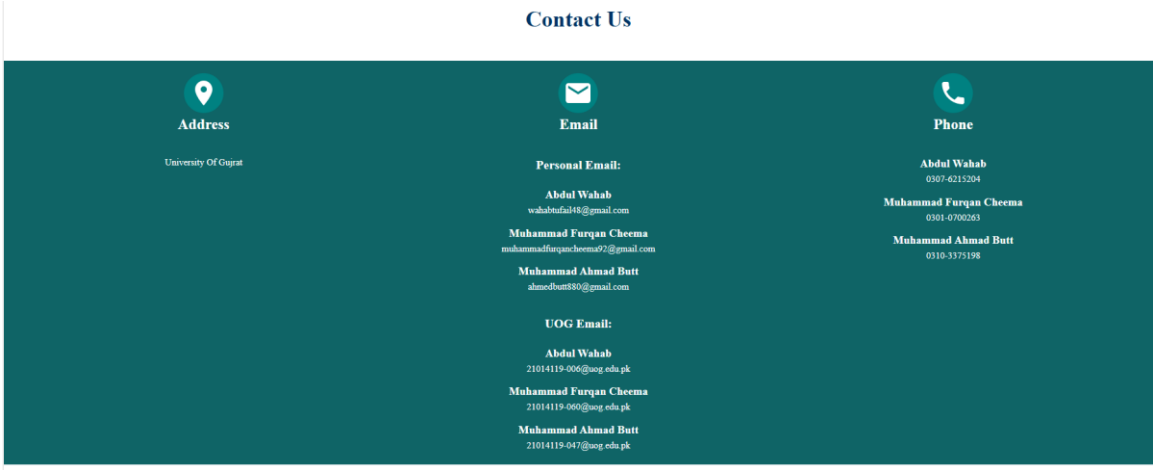


Navigational Map of Register

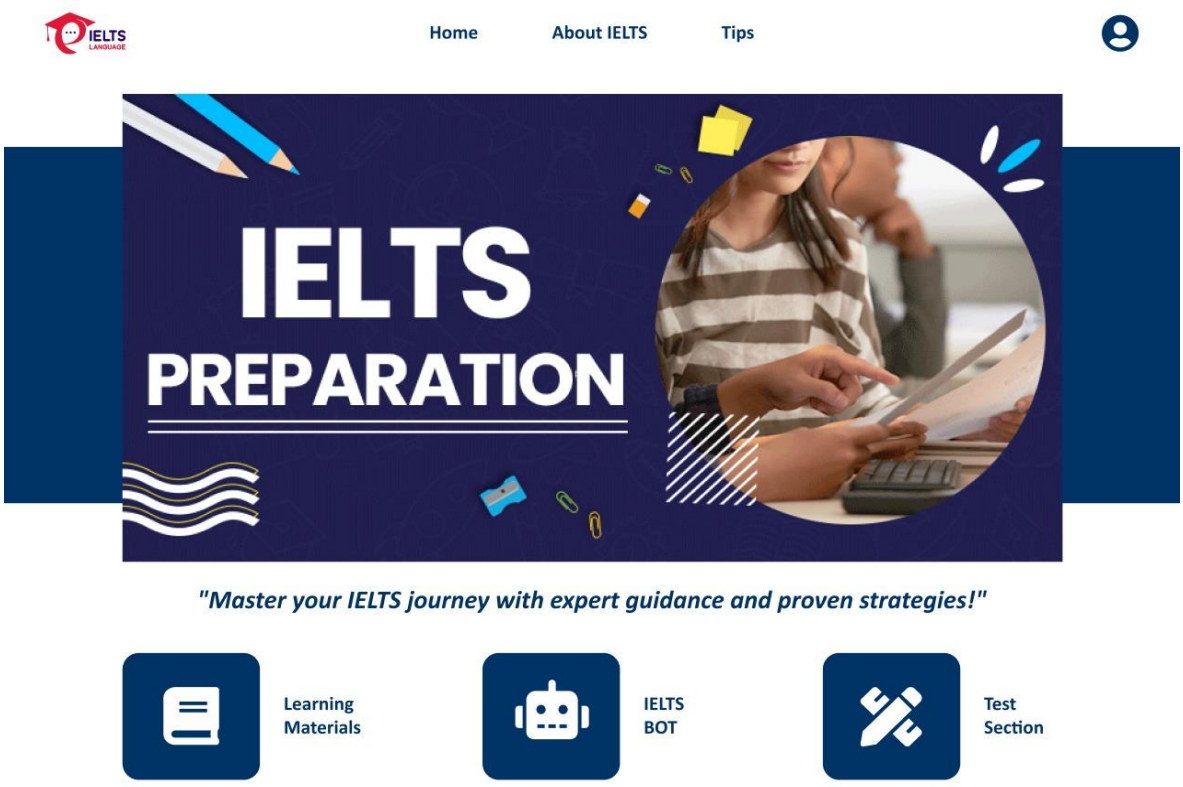


Navigational Map of Login

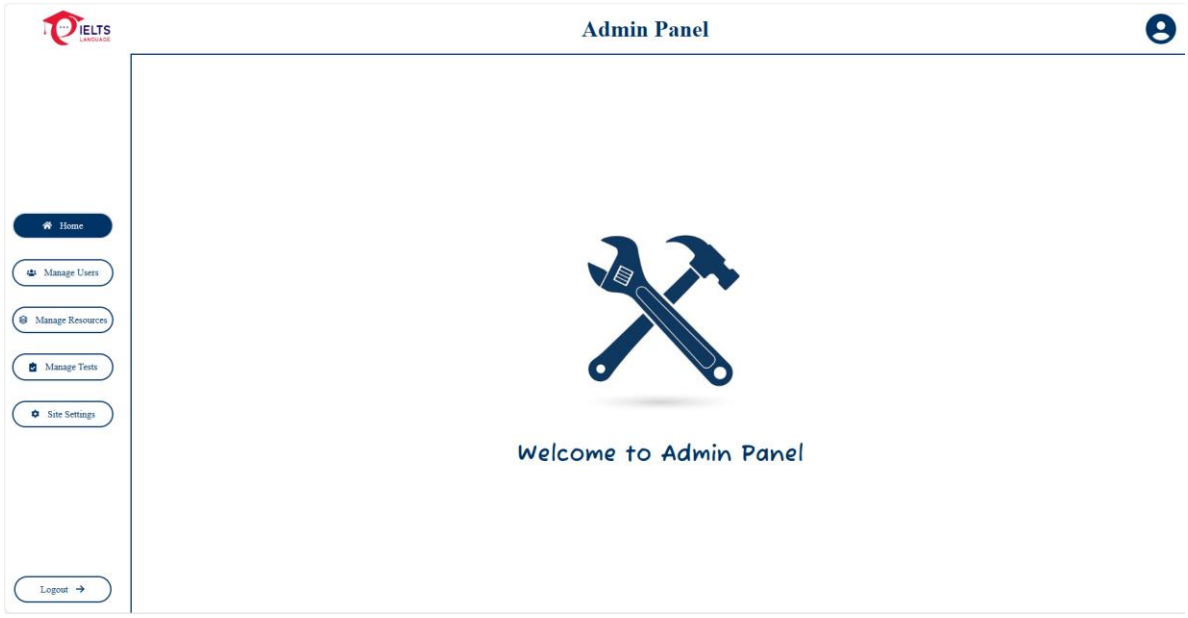
Navigational Map of Hero Section



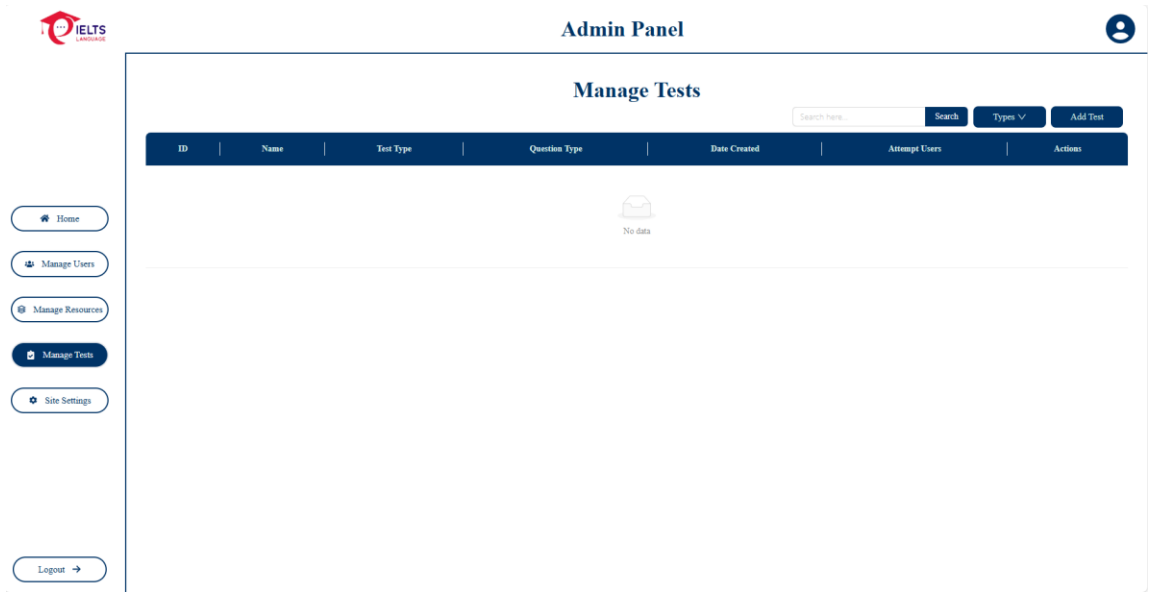
Navigational Map of Contact Us



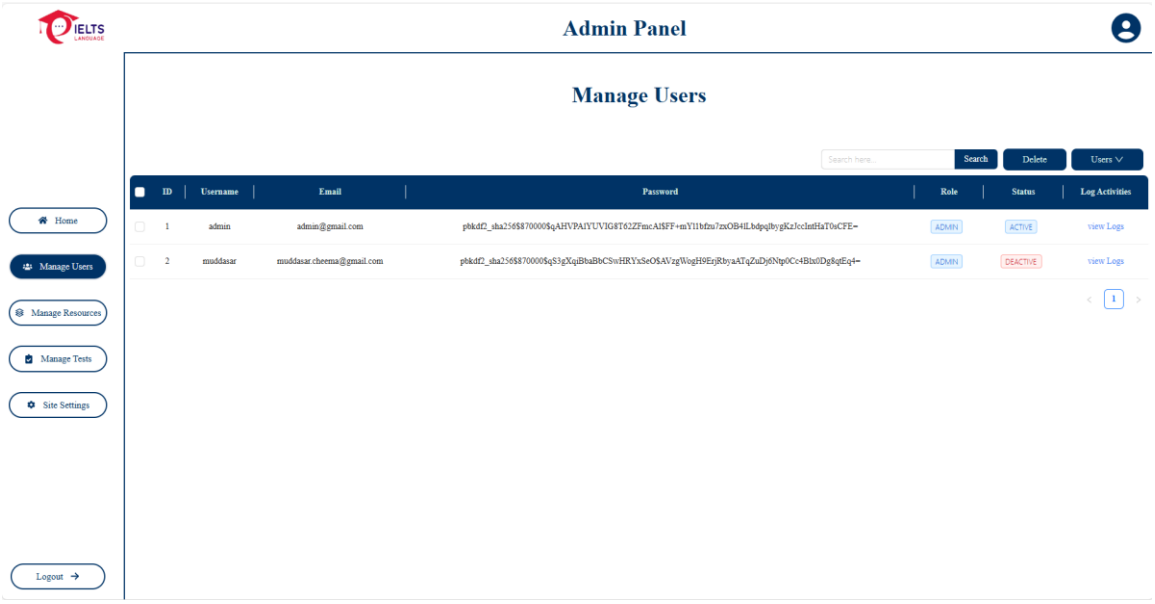
Navigational Map of Home Page



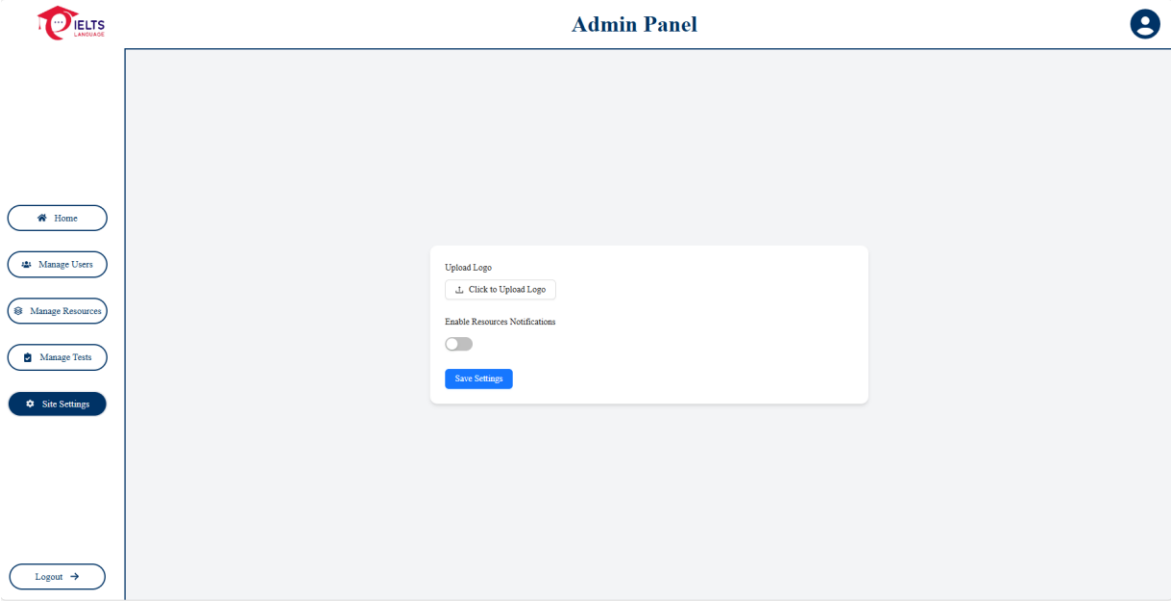
Navigational Map of Admin Panel



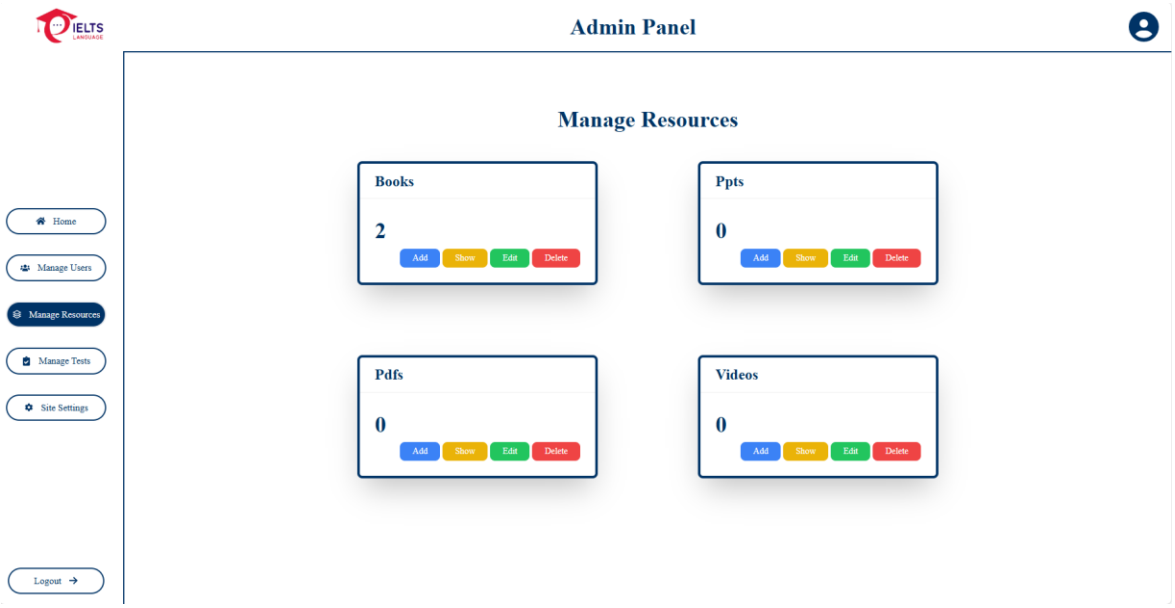
Navigational Map of Manage Tests (Admin)



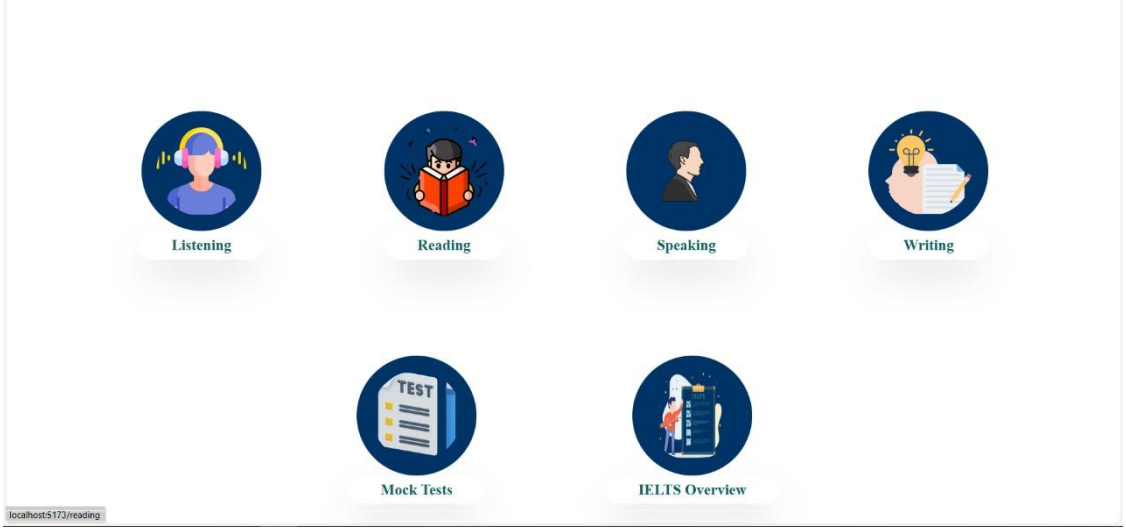
Navigational Map of Manage Users (Admin)



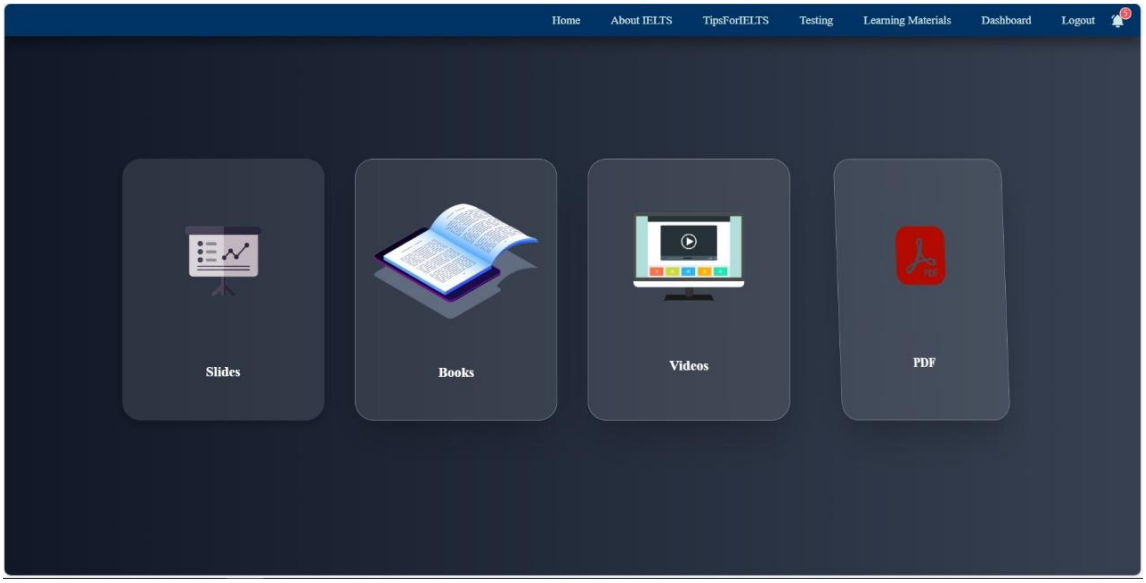
Navigational Map of Site Settings (Admin)



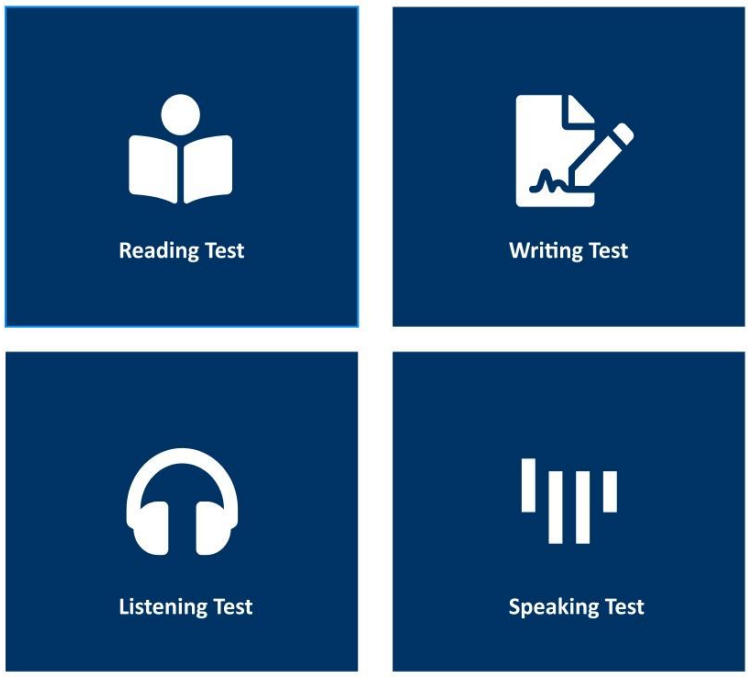
Navigational Map of Manage Resources



Navigational Map of User Activities



Navigational Map of Learning Materials (User)



Navigational Map of Take Tests (Users)

IELTS LANGUAGE

Reading

Duration:
60 minutes total

Reading Test - Introduction:

The IELTS Reading Test checks your ability to understand written English through a variety of question types. You'll read three passages and answer 40 questions in 60 minutes. The test assesses skills like skimming, scanning, understanding details, and recognizing opinions or arguments. Academic and General Training versions use different types of reading texts.

Structure:

- **Academic:** 3 long texts from books, journals, magazines, or newspapers.
  Topics are general interest and suitable for university-level students.
- **General Training:** 3 sections with shorter texts.
  Section 1: Everyday life (e.g., notices, ads)
  Section 2: Work-related texts (e.g., job descriptions)
  Section 3: One longer, complex text of general interest.

Questions:

40 questions total (divided over 3 sections/passages).

Reading Test 1 | Reading Test 2 | Reading Test 3

Navigational Map of Reading Test (Users)

IELTS LANGUAGE

Writing

Duration:
60 minutes total

Writing Test - Introduction:

The IELTS Writing Test assesses your ability to write clearly, organize ideas logically, and use accurate English. It has two tasks and must be completed in 60 minutes. You will need to describe information (Task 1) and present an argument or opinion (Task 2). Task 2 carries more weight in your final writing band score.

Structure:

Task 1:

- Academic: Describe a graph, chart, map, process, or diagram.
- General Training: Write a formal, semi-formal, or informal letter.
- Time advice: Spend 20 minutes (about 150 words).

Task 2:

- Both Academic and General: Write an essay (opinion, discussion, solution, etc.).
- Time advice: Spend 40 minutes (about 250 words).

Writing Test 1 | Writing Test 2 | Writing Test 3

Navigational Map of Writing Test (Users)

IELTS LANGUAGE

Listening

Duration:

About 30 minutes to listen and answer.
Plus 10 extra minutes (paper-based)

Listening Test - Introduction:

The IELTS Listening Test checks your ability to understand spoken English in real-life situations. You will listen to four recordings and answer 40 questions in about 30 minutes, plus 10 minutes extra (only in paper-based test) to transfer your answers.
Both Academic and General Training candidates take the same Listening Test.

Structure:

- **Part 1:** Conversation about everyday social needs (e.g., booking tickets).
- **Part 2:** Monologue about a general topic (e.g., tour guide talk).
- **Part 3:** Conversation related to education or training (e.g., students discussing an assignment).
- **Part 4:** Academic lecture or speech (e.g., university talk).

Key Points:

- Total 4 Parts and 40 questions.
- Difficulty increases with each part.
- You hear the recording only once.
- Questions types include: multiple choice, form completion, sentence completion, map labeling, etc.

Listening Test 1 | Listening Test 2 | Listening Test 3

Navigational Map of Listening Test (Users)

IELTS LANGUAGE

Speaking

Duration:

11 to 14 minutes

Speaking Test - Introduction:

The IELTS Speaking Test assesses your ability to communicate in English through a face-to-face interview. It lasts 11–14 minutes and is the same for both Academic and General Training candidates. The test is recorded and divided into three parts to evaluate your fluency, vocabulary, grammar, and pronunciation.

Structure:

- **Part 1: Introduction and Interview**
  - → The examiner asks general questions about you (home, family, work, studies, interests).
  - → Lasts about 4–5 minutes.
- **Part 2: Long Turn (Cue Card)**
  - → You are given a topic and have 1 minute to prepare.
  - → Then you speak for 1–2 minutes on the topic.
  - → Examiner may ask a quick follow-up question.
- **Part 3: Discussion**
  - → A two-way discussion related to the Part 2 topic.
  - → Focuses on expressing opinions, discussing abstract ideas.
  - → Lasts about 4–5 minutes.

Speaking Test

Navigational Map of Speaking Test (Users)

IELTS

IELTS (International English Language Testing System) is a globally recognized English proficiency test designed to assess the language ability of candidates who need to study,work, or migrate to an English-speaking environment. It evaluates four key skills: Listening, Reading, Writing, and Speaking, and is jointly managed by the British Council, IDP: IELTS Australia, and Cambridge English.

Why IELTS

IELTS is a widely accepted English language test used for study, work, and migration. Recognized by universities and governments around the world, it assesses real-life English skills through Listening, Reading, Writing, and Speaking. With Academic and General Training options, it meets the needs of students, professionals, and migrants. Its reliability, fairness, and global reach make IELTS a trusted choice for proving English proficiency.

1. General IELTS Tips

Understand the Test Format

- Familiarize yourself with the four modules: Listening, Reading, Writing, and Speaking.
- Learn the number of questions and timing for each section.
- Know the difference between Academic and General Training versions.

Time Management Strategies

- Practice full mock tests under timed conditions.
- Use the first few minutes to skim instructions.
- Don't dwell too long on any one question—move on and return if needed.

How IELTS is Scored (Band Descriptors)

- Bands are given from 0 to 9 in half-point increments.
- Understand criteria: Task Achievement, Coherence, Vocabulary, Grammar (for Writing & Speaking).
- Listening/Reading: raw scores are converted to bands.

Common Mistakes to Avoid

- Leaving blanks—always attempt an answer.
- Not reading instructions carefully.
- Copying directly from reading passages (especially in Writing).
- Speaking too little or too much off-topic.

2. Best Time to Take IELTS

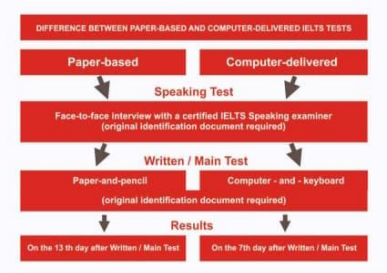
- Plan 2–3 months before your application deadline (e.g., university or visa).
- Avoid last-minute booking—gives time to prepare & retake if needed.
- Morning slots (usually 9 AM) are better for fresh focus.

3. When to Start Preparation

- Start 6–8 weeks before test date.
- Take a mock test early to know your level.
- Focus more on weaker modules.

4. Retaking IELTS

- There's no limit on retakes.
- You can retake only one module (IELTS One Skill Retake) in some countries.



5. Test Day Tips

- Arrive early (30–45 mins before).
- Bring ID/passport used for registration.
- Stay calm and hydrated.

6. Paper-based vs Computer-based

- Computer-based = faster results (3–5 days), flexible timing.
- Paper-based = good if you prefer writing by hand.

7. Practice Sources

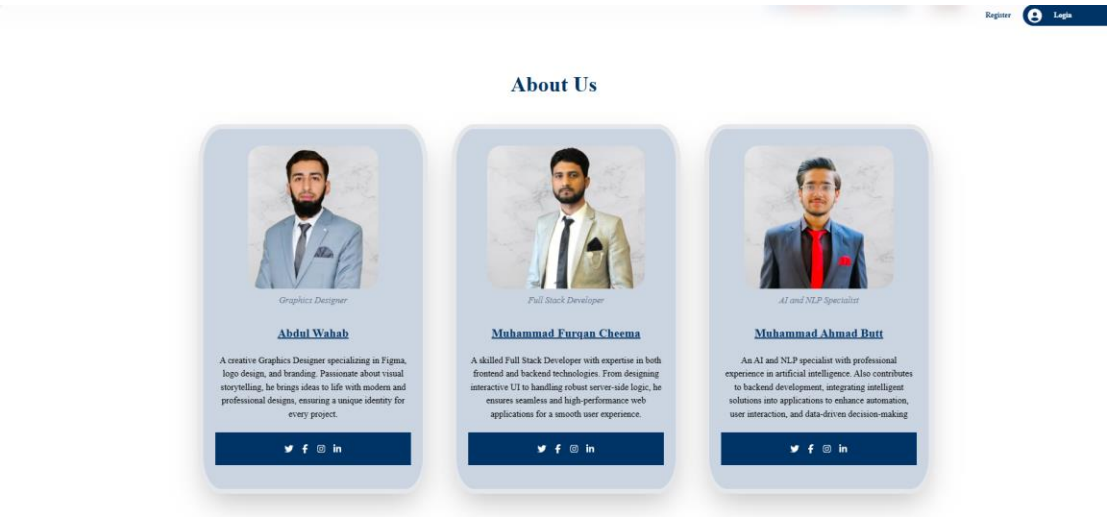
- Use official Cambridge IELTS books and British Council resources.
- Don't rely too much on random YouTube tips—stick to reliable sources.

8. Improve English Daily

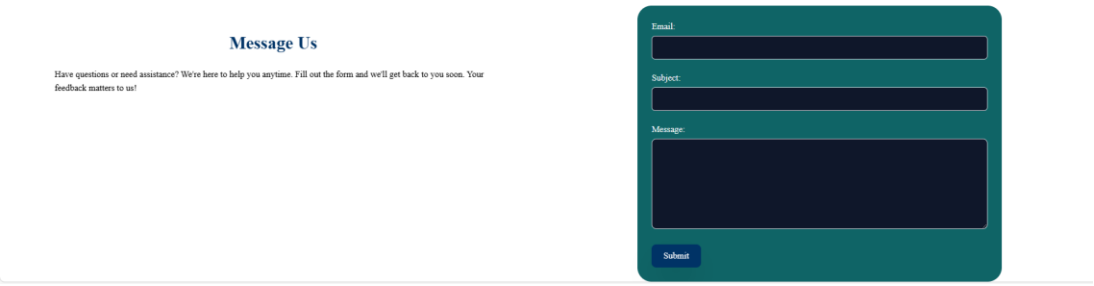
- Watch English shows, read articles, speak with friends, or use speaking apps.

Navigational Map of Tips (Users)

Navigational Map of ChatBot



Navigational Map of About Us



Navigational Map of Message Us

4.5 Trace-ability Matrix

Feature	Use Case ID	UI ID	Priority	Use Case Cross Ref	DB Table ID	Elaborated Use-case ID	Dependent Classes
User Registration	UC_1	UI_1	Mandatory	None	DB_User	UC_1	User
Secure Login	UC_2	UI_2	Mandatory	UC_1	DB_User	UC_2	User
Manage Roles and Permissions	-	UI_3	Mandatory	UC_2	DB_Roles, DB_Permissions	-	Admin
Manage User Profiles	-	UI_4	Should Have	UC_1, UC_2	DB_UserProfile	-	User
Take Practice Tests	UC_3	UI_5	Mandatory	UC_2	DB_Tests, DB_Results	UC_3	Test, Question
Evaluate Writing Tasks	-	UI_6	Mandatory	UC_3	DB_WritingTasks, DB_Evaluation	-	Test
Evaluate Speaking Tasks	-	UI_7	Mandatory	UC_3	DB_SpeakingTasks, DB_Evaluation	-	Test
Automated Scoring	-	UI_8	Mandatory	UC_3	DB_Tests, DB_Scores	-	Test
Manage Learning Materials	UC_4	UI_9	Should Have	UC_2	DB_LearningMaterials	UC_4	Admin, Learning Material
Update Study Materials	UC_5	UI_10	Should Have	UC_4	DB_LearningMaterials	UC_5	Admin, Learning Material
Access Learning Materials	UC_6	UI_11	Should Have	UC_4	DB_LearningMaterials	UC_6	User, Learning Material
Stream Media Content	-	UI_12	Should Have	UC_6	DB_MediaContent	-	Learning Material
Send Real-Time Notifications	-	UI_13	Should Have	UC_3, UC_4, UC_5	DB_Notifications	-	Notification

Send Email/Push Notifications	-	UI_14	Should Have	UC_3, UC_4, UC_5	DB_Notifications	-	Notification
Admin Dashboard	UC_7	UI_15	Mandatory	UC_4, UC_5	DB_Admin, DB_Reports	UC_7	Admin
Generate Reports	-	UI_16	Good To Have	UC_7	DB_Reports	-	Admin
Maintenance Mode	-	UI_17	Good To Have	UC_2, UC_3	DB_SystemStatus	-	Admin

Chapter 5: Software Testing

5.1 Introduction:

This section adheres to the **IEEE Standard for Software Test Documentation (Std 829-1998)**, outlining the essential artifacts required for a comprehensive testing deliverable.

The **IELTS Preparation Web** is a responsive web platform designed to assist students in preparing for the IELTS exam through interactive practice tests, NLP-based feedback, and progress tracking. Given its web-based nature, testing must address:

- **Cross-browser compatibility** (Chrome, Firefox, Safari, Edge).
- **Performance under varying network conditions** (e.g., low bandwidth).
- **Usability** across devices (desktops, tablets, smartphones).
- **Security** of user data and NLP-driven evaluations.
- **Integration** with backend APIs and third-party services (e.g., NLP models).

This deliverable does not prescribe specific testing methodologies or tools but ensures:
Traceability of tests to functional/non-functional requirements.
Clear documentation of test scope, cases, and outcomes.
Identification of defects and their severity levels.
The goal is to validate that the platform meets its objectives reliably before deployment, ensuring a seamless experience for IELTS aspirants worldwide.

Following are standard artifacts, which must be included in this deliverable:

1. Test Plan
2. Test Design Specification
3. Test Case Specification
4. Test Procedure Specification
5. Test Item Transmittal Report
6. Test Log
7. Test Incident Report
8. Test Summary Report

5.2. Test plan

5.2.1. Purpose

The purpose of test plan is making sure that features this system provides are compatible with each other and how the system will react to the inputs provided by the user. The error occurring due to invalid inputs lets us know what went wrong. The testing will also check whether expected and actual outcomes are being met. If any case fails, then it will be reviewed and required changes will be made to it.

5.2.2. Outline

A test plan shall have the following structure:

a. Test plan identifier
b. Introduction
c. Test items
d. Features to be tested
e. Features not to be tested
f. Approach
g. Item pass/fail criteria
h. Suspension criteria and resumption requirements
i. Test deliverables
j. Testing tasks
k. Environmental needs
l. Responsibilities
m. Staffing and training needs
n. Schedule
o. Risks and contingencies
p. Approvals

The sections shall be ordered in the specified sequence. Additional sections may be included immediately prior to Approvals. If some or all of the content of a section is in another document, then a reference to that material may be listed in place of the corresponding content. The referenced material must be attached to the test plan or available to users of the plan.
Details on the content of each section are contained in the following sub-clauses.

5.2.2.1. Test plan identifier

- **IELTS**: Abbreviation for "IELTS Preparation Web"
- **TP**: Denotes "Test Plan"
- **001**: First version of the test plan

The purpose of test plan identifier is:

- Ensures traceability across testing phases.
- Facilitates version control (e.g., revisions will increment to IELTS-TP-002).
- Aligns with IEEE 829-1998 for standardized documentation.

5.2.2.2. Introduction

This plan validates the **IELTS Preparation Web**, a platform for IELTS exam preparation with NLP-driven feedback. Key components under test:

- **User Authentication**: JWT-based login, role-based access (students/admins).
- **Practice Tests**: Listening, Reading, Writing, and Speaking sections.
- **NLP Evaluation**: Grammar, coherence, and pronunciation analysis.
- **Admin CMS**: Learning material uploads and progress tracking.

5.2.2.3. Test items

Test Item: IELTS Preparation Web - Version 1.0
Characteristics:

- Web-based (React frontend, Python/FastAPI backend).

- Compatible with Chrome, Firefox, Safari, Edge.
- Requires internet connectivity.

Documentation:

1. **Requirements Specification**: Functional/NFRs (e.g., NLP accuracy).
2. **Design Documents**: Class diagrams, API schemas.
3. **User Guides**: Student and admin manuals.

Excluded Items:

- Offline functionality.

5.2.2.4. Features to be tested

5.2.2.4.1 Registration and Authentication

- User registration with LinkedIn integration.
- Secure login and logout functionality.
- Validation of access control based on user type (Admin/User).
- Session management and unauthorized access prevention.

5.2.2.4.2 Admin Functionalities

a. User Management

- Full CRUD operations: Create, Read, Update, Delete users.
- Addition of new activities for users.

b. Learning Management (Admin Side)

- Creation and update of learning materials.
- Reading and deletion of materials.
- Initiation of new learning activities.

c. Test Management

- Create, update, read, and delete test entries.
- Linking tests to activities for learners.

d. Site Settings

- Create, update, and manage UI/UX elements.
- Design and content management functionality.

5.2.2.4.3 User Functionalities

a. Main Pages

- Access to Home, Tips Page, About Page, and Chatbot.
- Page load testing and responsiveness.

b. Learning Management (User Side)

- Access to IELTS categories and sections (Listening, Reading, Writing, Speaking).
- Viewing and downloading books, PDFs, PPTs, and videos.
- Navigation and access to categorized learning materials.

c. Resource Access

- Browsing various resources related to IELTS preparation.
- Access to tests and practice materials from the UI.

5.2.2.4.4 Chatbot Integration

- Chatbot response accuracy and user query handling.
- NLP interaction for FAQs and IELTS guidance.

5.2.2.5. Features not to be tested

5.2.2.5.1. Advanced Analytics & Forecasting

- Predictive analytics for demand forecasting.
- Machine learning-driven sales trend predictions.

5.2.2.5.2. Third-Party Integration Modules

- Integration with external CRMs or accounting software.
- SMS/email notification services for low-stock or expiry alerts.

5.2.2.5.3. Mobile App Interface

- Testing on mobile versions of the admin or employee dashboards.
- Responsiveness across mobile browsers or devices.

5.2.2.5.4. Localization & Multi-Language Support

- System translations to other languages (English-only environment will be tested).
- RTL (Right-to-left) layout rendering.

5.2.2.5.5. UI/UX Customization

- Personalization of themes, dashboard layouts, or user interface themes.
- Custom user preferences beyond default roles.

5.2.2.5.6. Hardware Peripheral Integration

- Barcode scanners, receipt printers, or external POS hardware testing.

5.2.2.5.7. Performance and Load Testing

- Stress testing with concurrent sales or bulk purchase entries.
- Load endurance across large-scale invoice processing.

5.2.2.6. Approach

Testing will be based on a combined manual + automated strategy across features shown in the site map.

Functional Testing

- Test Scope Includes:
    - **User Role Management** (Admin/User distinction)
    - **CRUD operations** (User Mgmt, Learning Mgmt, Test Mgmt, Site Settings)
    - **IELTS Content Access** (Books, PDFs, Videos)

Usability Testing

- Focus Areas:
    - Navigation clarity in "Main Page", "Chatbot", and "Tips Page"
    - Form validations in "Registration", "Login", and CRUD forms

Compatibility Testing

- Devices: Desktop & Tablet (no mobile UI coverage)
- Pages: All feature groups like “Home”, “Test Page”, “Learning Materials”

Security Testing

- Protects:
    - Admin/user role-based access segregation
    - CRUD actions for sensitive resources (e.g., tests and site settings)

Regression Testing

- Automation Tools: Jest for unit testing CRUD logic, Cypress for workflows like:
    - Registration → Login → Role Navigation

- Test Creation → Attempt → Result Recording

5.2.2.7. Item pass/fail criteria

- **Pass Criteria:**
  - The feature or functionality performs exactly as described in the test case.
  - All inputs yield expected outputs without errors or crashes.
  - User interface components display and behave as intended across supported devices and browsers.
  - Security checks (e.g., login, access control) are enforced without bypass.
  - Integration points (e.g., chatbot responses, learning material downloads) function correctly.
  - System responses meet performance benchmarks (e.g., loading times, processing delays).
- **Fail Criteria:**
  - The system produces incorrect or unexpected output for a given input.
  - Any crash, unhandled exception, or system hang occurs during testing.
  - UI components are missing, misaligned, or behave inconsistently.
  - Role-based access is violated (e.g., a user accesses admin features).
  - Third-party integrations fail to respond or behave inaccurately.
  - Performance is below acceptable levels (e.g., excessive response times).

For each test case, a **"Pass"** status will be recorded if **all steps execute successfully and results match expectations**. A **"Fail"** status will be recorded if **any critical deviation is observed** from the expected result.

5.2.2.8. Suspension criteria and resumption requirements

Suspension Triggers

- Admin/User page load failure
- Broken test-taking workflow
- Learning material CRUD issues
- Chatbot malfunction

Resumption Steps

- Critical bug fix → Validate with unit + E2E tests
- Role-based issues → Confirm with stakeholder approval
- Content failure (PDF, PPT, Video) → Ensure resource accessibility restored.

5.2.2.9. Test deliverables

Identify the deliverable documents. The following documents should be included:

a. Test plan;
b. Test design specifications;
c. Test case specifications;
d. Test procedure specifications;
e. Test item transmittal reports;
f. Test logs;
g. Test incident reports;
h. Test summary reports.

Test input data and test output data should be identified as deliverables.

Test tools (e.g., module drivers and stubs) may also be included.

5.2.2.10. Testing tasks

The following testing tasks are required to prepare and execute comprehensive testing for the IELTS Learning and Testing System:

a) Test Planning

• Develop a detailed test plan specifying scope, objectives, testing strategy, and resource allocation.

• Align testing milestones with development sprints and release schedules.

b) Test Design

Design test specifications covering:

- User registration and login.
- Admin functionalities (content upload, test creation).
- Learning modules (video playback, document access).
- Test modules (attempt logic, feedback).
- Create test cases for: o Functional testing (e.g., test submission).
- Usability testing (e.g., user dashboard flow).
- Security testing (e.g., role-based restrictions).
- Document test execution procedures and acceptance criteria.

c) Test Environment Setup

Deploy:

Frontend:

Next.js (deployed on Vercel or similar).

Backend:

Node.js with Express.

Database:

MongoDB Atlas.

Prepare sample test accounts (admin, student).

d) Test Data Preparation

Generate datasets including:

- Users (with various roles).
- Learning materials (PDFs, videos, PowerPoint).
- Test questions and results.

e) Test Execution

• Execute test cases following pre-defined steps.

• Log results (pass/fail, screenshots, system logs).

f) Defect Reporting

Use Jira to report issues with:

Steps to reproduce.

- Expected vs. actual results.
- Priority and severity tagging.

g) Defect Management

• Track defect resolution and assign to responsible developers.

• Retest and close after successful fixes.

h) Test Reporting

Generate reports containing:

- Test coverage.
- Open/closed defects.
- Risk areas and mitigations.

i) Test Closure

• Conduct final review with all stakeholders.
• Archive test documents (cases, logs, reports, approvals).

5.2.2.11. Environmental needs

Necessary Properties:

• Frontend: Chrome, Firefox, Edge, Safari (latest stable versions).
• Backend: FastAPI-based services, Dockerized Flask/Django microservices, MongoDB Atlas database.
• Roles: Admin, Instructor, Student (test accounts configured).
• Network: Stable internet connection (minimum 10 Mbps bandwidth).

Desired Properties:

• Dedicated Testing Server: Separate from production environment, with Docker and necessary containers deployed.
• Backup Devices: Laptops, tablets, and mobile phones for responsive UI testing.
• Secure VPN: For remote and offsite test team members to securely access staging servers.

Other Needs:

Access to:

- Complete system requirement specifications and design documents.
- API documentation (Swagger/OpenAPI specifications for FastAPI/Flask services).
- Project manager and DevOps engineer for environment troubleshooting.

5.2.2.12. Responsibilities

a) Test Manager

• Oversee testing strategy and timelines.
• Ensure resource allocation (test environments, tools, personnel).
• Approve test deliverables (test plan, test cases, final reports).

b) Testing Team

• Design and execute detailed test cases for all system modules.
• Report defects and validate fixes through structured defect tracking.
• Ensure environment readiness (refer to Section 5.2.2.11).

c) Developers

• Address critical defects (Priority 1 and 2) within 24 hours.
• Provide updated system builds for retesting after fixes.

d) Student Representatives (User Representatives)

• Validate usability (e.g., registration, test-taking experience).
• Confirm business logic (e.g., test scoring, module access rules).

Accountability:

• Testing team → Ensure verification of all test items (Section 5.2.2.3).
• Project manager → Ensure environmental needs (Section 5.2.2.11) are met.

5.2.2.13 Staffing and training needs

To ensure the successful testing of the IELTS Learning and Testing System, the following staffing and training requirements must be met:

Test Manager

Responsibilities:

- Oversee the end-to-end testing lifecycle.
- Coordinate with developers, content creators, and project stakeholders.
- Report on testing progress, risks, and mitigation plans.

Skills Required:

- Experience managing software testing projects (preferably e-learning platforms).
- Strong communication, coordination, and leadership skills.
- Familiarity with Agile/Scrum workflows and educational technology standards.

b) Test Analysts (2–3 members)

Responsibilities:

- Design, execute, and document test cases.
- Log defects in Jira and coordinate with developers for resolution.
- Generate test execution and defect status reports.

Skills Required:

- Proficiency in manual web application testing (functional, regression, usability).
- Knowledge of learning management systems (LMS) workflows.
- Basic experience in automation tools (e.g., Cypress, Playwright) is a plus.

c) Training Plan

On-the-Job Training:

- Walkthrough of React.js frontend, Node.js backend, and MongoDB database structure.
- Hours allocated to practice API testing using Postman/Swagger tools.

External Training:

- ISTQB Certification for test analysts (foundation level recommended).
- Workshops on usability/accessibility testing and OWASP security basics.

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5.2.2.14. Schedule

Given the **3.5-month deadline**, the testing timeline is structured as follows:

Task	Duration	Timeline
Test Planning	1 week	Week 1
Test Design	2 weeks	Weeks 2–3
Test Case Development	3 weeks	Weeks 4–6
Test Environment Setup	1 week	Week 7
Test Execution	8 weeks	Weeks 8–15
Test Reporting	1 week	Week 16

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5.2.2.15. Risks and contingencies

Several high-risk factors have been identified for the testing phase of the IELTS Learning and Testing System:

1. Hardware and Software Availability:
There is a risk of delay in accessing cloud services (Vercel deployments, MongoDB Atlas, Docker Hub images).
• **Mitigation:** Local Docker containers will be used for initial frontend/backend testing.
2. Backend/API Delays:
Delays in the completion of FastAPI or Flask endpoints could block integration testing.
• **Mitigation:** Focus will shift to React UI unit testing and mock API testing during backend delays.
3. Browser Compatibility Issues:
Rendering failures, especially in Safari (e.g., rich text editors or media upload features).
• **Mitigation:** Prioritized cross-browser testing during Weeks 8 and 9.
4. Staff Shortages:
Test analysts becoming unavailable during major test execution phases.
• **Mitigation:** Developers will be cross-trained to perform smoke testing, ensuring coverage.
5. Testing Tool Failures:
Potential instability in existing automation tools (e.g., Cypress issues during large form testing).
• **Mitigation:** Fall back to Selenium or Playwright for critical end-to-end flows.
6. Database Downtime:
MongoDB Atlas access issues could disrupt system testing.
• **Mitigation:** Backup JSON datasets will be imported into a local Dockerized MongoDB instance for fallback.
Contingency Protocols:
• Daily stand-up meetings (15 minutes) to immediately raise blockers.
• Weekly risk review reports shared with the project manager.
• Extended working hours or weekend shifts will be planned if delays exceed 2–3 days.
• Immediate switch to alternative testing tools or data environments if major disruptions occur.

5.2.2.16 Approvals

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Title: Project Supervisor
Date: April 28, 2025

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5.3. Test design specification

5.3.1. Purpose

To prescribe the scope, approach, resources, and schedule of the testing activities. To identify the items being tested, the features to be tested, the testing tasks to be performed, the personnel responsible for each task, and the risks associated with this plan.

5.3.2. Outline

A test plan shall have the following structure:

a. Test plan identifier;
b. Introduction;
c. Test items;
d. Features to be tested;
e. Features not to be tested;
f. Approach;
g. Item pass/fail criteria;
h. Suspension criteria and resumption requirements;
i. Test deliverables;
j. Testing tasks;
k. Environmental needs;
l. Responsibilities;
m. Staffing and training needs;
n. Schedule;
o. Risks and contingencies;
p. Approvals.

The sections shall be ordered in the specified sequence. Additional sections may be included immediately prior to Approvals. If some or all of the content of a section is in another document, then a reference to that material may be listed in place of the corresponding content. The referenced material must be attached to the test plan or available to users of the plan.
Details on the content of each section are contained in the following sub-clauses.

5.3.2.1 Test plan identifier

- **IELTS**: Abbreviation for "IELTS Preparation Web"
- **TP**: Denotes "Test Plan"
- **001**: First version of the test plan

The purpose of test plan identifier is:

- Ensures traceability across testing phases.
- Facilitates version control (e.g., revisions will increment to IELTS-TP-002).
- Aligns with IEEE 829-1998 for standardized documentation.

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5.3.2.2. Introduction

This plan validates the **IELTS Preparation Web**, a platform for IELTS exam preparation with NLP-driven feedback. Key components under test:

- **User Authentication**: JWT-based login, role-based access (students/admins).
- **Practice Tests**: Listening, Reading, Writing, and Speaking sections.
- **NLP Evaluation**: Grammar, coherence, and pronunciation analysis.
- **Admin CMS**: Learning material uploads and progress tracking.

5.3.2.3. Test items

Test Item: IELTS Preparation Web - Version 1.0
Characteristics:

- Web-based (React frontend, Python/FastAPI backend).

- Compatible with Chrome, Firefox, Safari, Edge.
- Requires internet connectivity.

Documentation:

4. **Requirements Specification**: Functional/NFRs (e.g., NLP accuracy).
5. **Design Documents**: Class diagrams, API schemas.
6. **User Guides**: Student and admin manuals.

Excluded Items:

Offline functionality.

5.3.2.4. Features to be tested

5.3.2.4.1 Registration and Authentication

- User registration with LinkedIn integration.
- Secure login and logout functionality.
- Validation of access control based on user type (Admin/User).
- Session management and unauthorized access prevention.

5.3.2.4.2 Admin Functionalities

a. User Management

- Full CRUD operations: Create, Read, Update, Delete users.
- Addition of new activities for users.

b. Learning Management (Admin Side)

- Creation and update of learning materials.
- Reading and deletion of materials.
- Initiation of new learning activities.

c. Test Management

- Create, update, read, and delete test entries.
- Linking tests to activities for learners.

d. Site Settings

- Create, update, and manage UI/UX elements.
- Design and content management functionality.

5.3.2.4.3 User Functionalities

a. Main Pages

- Access to Home, Tips Page, About Page, and Chatbot.
- Page load testing and responsiveness.

b. Learning Management (User Side)

- Access to IELTS categories and sections (Listening, Reading, Writing, Speaking).
- Viewing and downloading books, PDFs, PPTs, and videos.
- Navigation and access to categorized learning materials.

c. Resource Access

- Browsing various resources related to IELTS preparation.
- Access to tests and practice materials from the UI.

5.3.2.4.4 Chatbot Integration

- Chatbot response accuracy and user query handling.

NLP interaction for FAQs and IELTS guidance.

5.3.2.5. Features not to be tested

5.3.2.5.1. Advanced Analytics & Forecasting

- Predictive analytics for demand forecasting.
- Machine learning-driven sales trend predictions.

5.3.2.5.2. Third-Party Integration Modules

- Integration with external CRMs or accounting software.
- SMS/email notification services for low-stock or expiry alerts.

5.3.2.5.3. Mobile App Interface

- Testing on mobile versions of the admin or employee dashboards.
- Responsiveness across mobile browsers or devices.

5.3.2.5.4. Localization & Multi-Language Support

- System translations to other languages (English-only environment will be tested).
- RTL (Right-to-left) layout rendering.

5.3.2.5.5. UI/UX Customization

- Personalization of themes, dashboard layouts, or user interface themes.
- Custom user preferences beyond default roles.

5.3.2.5.6. Hardware Peripheral Integration

- Barcode scanners, receipt printers, or external POS hardware testing.

5.3.2.5.7. Performance and Load Testing

- Stress testing with concurrent sales or bulk purchase entries.
- Load endurance across large-scale invoice processing.

5.3.2.6. Approach

Testing will be based on a combined manual + automated strategy across features shown in the site map.

Functional Testing

- Test Scope Includes:
    - **User Role Management** (Admin/User distinction)
    - **CRUD operations** (User Mgmt, Learning Mgmt, Test Mgmt, Site Settings)
    - **IELTS Content Access** (Books, PDFs, Videos)

Usability Testing

- Focus Areas:
    - Navigation clarity in "Main Page", "Chatbot", and "Tips Page"
    - Form validations in "Registration", "Login", and CRUD forms

Compatibility Testing

- Devices: Desktop & Tablet (no mobile UI coverage)
- Pages: All feature groups like “Home”, “Test Page”, “Learning Materials”

Security Testing

- Protects:
    - Admin/user role-based access segregation
    - CRUD actions for sensitive resources (e.g., tests and site settings)

Regression Testing

- Automation Tools: Jest for unit testing CRUD logic, Cypress for workflows like:
    - Registration → Login → Role Navigation

- Test Creation → Attempt → Result Recording

5.3.2.7. Item pass/fail criteria

- **Pass Criteria:**
  - The feature or functionality performs exactly as described in the test case.
  - All inputs yield expected outputs without errors or crashes.
  - User interface components display and behave as intended across supported devices and browsers.
  - Security checks (e.g., login, access control) are enforced without bypass.
  - Integration points (e.g., chatbot responses, learning material downloads) function correctly.
  - System responses meet performance benchmarks (e.g., loading times, processing delays).
- **Fail Criteria:**
  - The system produces incorrect or unexpected output for a given input.
  - Any crash, unhandled exception, or system hang occurs during testing.
  - UI components are missing, misaligned, or behave inconsistently.
  - Role-based access is violated (e.g., a user accesses admin features).
  - Third-party integrations fail to respond or behave inaccurately.
  - Performance is below acceptable levels (e.g., excessive response times).

For each test case, a **"Pass"** status will be recorded if **all steps execute successfully and results match expectations**. A **"Fail"** status will be recorded if **any critical deviation is observed** from the expected result.

5.3.2.8. Suspension criteria and resumption requirements

Suspension Triggers

- Admin/User page load failure
- Broken test-taking workflow
- Learning material CRUD issues
- Chatbot malfunction

Resumption Steps

- Critical bug fix → Validate with unit + E2E tests
- Role-based issues → Confirm with stakeholder approval
- Content failure (PDF, PPT, Video) → Ensure resource accessibility restored.

5.3.2.9. Test deliverables

Identify the deliverable documents. The following documents should be included:

a. Test plan
b. Test design specifications
c. Test case specifications
d. Test procedure specifications
e. Test item transmittal reports
f. Test logs
g. Test incident reports
h. Test summary reports

Test input data and test output data should be identiÞed as deliverables. Test tools (e.g., module drivers and stubs) may also be included.

5.3.2.10. Testing tasks

The following testing tasks are required to prepare and execute comprehensive testing for the IELTS Learning and Testing System:

a) Test Planning

• Develop a detailed test plan specifying scope, objectives, testing strategy, and resource allocation.

• Align testing milestones with development sprints and release schedules.

b) Test Design

Design test specifications covering:

- User registration and login.
- Admin functionalities (content upload, test creation).
- Learning modules (video playback, document access).
- Test modules (attempt logic, feedback).
- Create test cases for: o Functional testing (e.g., test submission).
- Usability testing (e.g., user dashboard flow).
- Security testing (e.g., role-based restrictions).
- Document test execution procedures and acceptance criteria.

c) Test Environment Setup

Deploy:

Frontend:

Next.js (deployed on Vercel or similar).

Backend:

Node.js with Express.

Database:

MongoDB Atlas.

Prepare sample test accounts (admin, student).

d) Test Data Preparation

Generate datasets including:

- Users (with various roles).
- Learning materials (PDFs, videos, PowerPoint).
- Test questions and results.

e) Test Execution

• Execute test cases following pre-defined steps.

• Log results (pass/fail, screenshots, system logs).

f) Defect Reporting

Use Jira to report issues with:

Steps to reproduce.

- Expected vs. actual results.
- Priority and severity tagging.

g) Defect Management

• Track defect resolution and assign to responsible developers.

• Retest and close after successful fixes.

h) Test Reporting

Generate reports containing:

- Test coverage.
- Open/closed defects.
- Risk areas and mitigations.

i) Test Closure

• Conduct final review with all stakeholders.
• Archive test documents (cases, logs, reports, approvals).

5.3.2.11. Environmental needs

Necessary Properties:

• Frontend: Chrome, Firefox, Edge, Safari (latest stable versions).
• Backend: FastAPI-based services, Dockerized Flask/Django microservices, MongoDB Atlas database.
• Roles: Admin, Instructor, Student (test accounts configured).
• Network: Stable internet connection (minimum 10 Mbps bandwidth).

Desired Properties:

• Dedicated Testing Server: Separate from production environment, with Docker and necessary containers deployed.
• Backup Devices: Laptops, tablets, and mobile phones for responsive UI testing.
• Secure VPN: For remote and offsite test team members to securely access staging servers.

Other Needs:

Access to:

- Complete system requirement specifications and design documents.
- API documentation (Swagger/OpenAPI specifications for FastAPI/Flask services).

Project manager and DevOps engineer for environment troubleshooting.

5.3.2.12. Responsibilities

a) Test Manager

• Oversee testing strategy and timelines.
• Ensure resource allocation (test environments, tools, personnel).
• Approve test deliverables (test plan, test cases, final reports).

b) Testing Team

• Design and execute detailed test cases for all system modules.
• Report defects and validate fixes through structured defect tracking.
• Ensure environment readiness (refer to Section 5.2.2.11).

c) Developers

• Address critical defects (Priority 1 and 2) within 24 hours.
• Provide updated system builds for retesting after fixes.

d) Student Representatives (User Representatives)

• Validate usability (e.g., registration, test-taking experience).
• Confirm business logic (e.g., test scoring, module access rules).

Accountability:

• Testing team → Ensure verification of all test items (Section 5.2.2.3).
• Project manager → Ensure environmental needs (Section 5.2.2.11) are met.

5.3.2.13. Staffing and training needs

To ensure the successful testing of the IELTS Learning and Testing System, the following staffing and training requirements must be met:

Test Manager

Responsibilities:

- Oversee the end-to-end testing lifecycle.
- Coordinate with developers, content creators, and project stakeholders.
- Report on testing progress, risks, and mitigation plans.

Skills Required:

- Experience managing software testing projects (preferably e-learning platforms).
- Strong communication, coordination, and leadership skills.
- Familiarity with Agile/Scrum workflows and educational technology standards.

b) Test Analysts (2–3 members)

Responsibilities:

- Design, execute, and document test cases.
- Log defects in Jira and coordinate with developers for resolution.
- Generate test execution and defect status reports.

Skills Required:

- Proficiency in manual web application testing (functional, regression, usability).
- Knowledge of learning management systems (LMS) workflows.
- Basic experience in automation tools (e.g., Cypress, Playwright) is a plus.

c) Training Plan

On-the-Job Training:

- Walkthrough of React.js frontend, Node.js backend, and MongoDB database structure.
- Hours allocated to practice API testing using Postman/Swagger tools.

External Training:

- ISTQB Certification for test analysts (foundation level recommended).

Workshops on usability/accessibility testing and OWASP security basics.

5.3.2.14. Schedule

Given the **3.5-month deadline**, the testing timeline is structured as follows:

Task	Duration	Timeline
Test Planning	1 week	Week 1
Test Design	2 weeks	Weeks 2–3
Test Case Development	3 weeks	Weeks 4–6
Test Environment Setup	1 week	Week 7
Test Execution	8 weeks	Weeks 8–15
Test Reporting	1 week	Week 16

5.3.2.15. Risks and contingencies

Several high-risk factors have been identified for the testing phase of the IELTS Learning and Testing System:

1. Hardware and Software Availability:
There is a risk of delay in accessing cloud services (Vercel deployments, MongoDB Atlas, Docker Hub images).
• **Mitigation:** Local Docker containers will be used for initial frontend/backend testing.
2. Backend/API Delays:
Delays in the completion of FastAPI or Flask endpoints could block integration testing.
• **Mitigation:** Focus will shift to React UI unit testing and mock API testing during backend delays.
3. Browser Compatibility Issues:
Rendering failures, especially in Safari (e.g., rich text editors or media upload features).
• **Mitigation:** Prioritized cross-browser testing during Weeks 8 and 9.
4. Staff Shortages:
Test analysts becoming unavailable during major test execution phases.
• **Mitigation:** Developers will be cross-trained to perform smoke testing, ensuring coverage.
5. Testing Tool Failures:
Potential instability in existing automation tools (e.g., Cypress issues during large form testing).
• **Mitigation:** Fall back to Selenium or Playwright for critical end-to-end flows.
6. Database Downtime:
MongoDB Atlas access issues could disrupt system testing.
• **Mitigation:** Backup JSON datasets will be imported into a local Dockerized MongoDB instance for fallback.
Contingency Protocols:
• Daily stand-up meetings (15 minutes) to immediately raise blockers.
• Weekly risk review reports shared with the project manager.
• Extended working hours or weekend shifts will be planned if delays exceed 2–3 days.
• Immediate switch to alternative testing tools or data environments if major disruptions occur.

5.3.2.16. Approvals

Name: Muhammad Abo Bakar Aslam
Title: Project Supervisor
Date: April 28, 2025

5.4. Test Case Specification

5.4.1. Purpose

The purpose of the Test Case Specification is to provide detailed, executable test cases that validate the functionality, performance, and security of the IELTS Preparation Web application. Each test case is derived from the Test Design Specification.

5.4.2. Outline

A test case specification shall have the following structure:

a. Test case specification identifier
b. Test items
c. Input specifications
d. Output specifications
e. Environmental needs
f. Special procedural requirements
g. Inter case dependencies

The sections shall be ordered in the specified sequence. Additional sections may be included at the end.
Details on the content of each section are contained in the following sub-clauses.

5.4.2.1. Test case specification identifier

The Test Case Specification Identifier is a unique reference code assigned to distinguish this test case documentation from other test artifacts. For the IELTS Preparation Web, the identifier is:

IELTS -TCS-001

- **IELTS**: Abbreviation for "IELTS Preparation Web"
- **TCS**: Denotes "Test Case Specification"
- **001**: Indicates the first version of the test case specification

Purpose of the Identifier

This standardized identifier ensures:

Traceability

Links test cases to:

- Requirements (Section 5.2.2.4)
- Test Design Specification (Section 5.3)
- Test Execution Logs (Section 5.6)

Version Control

- Tracks revisions
- Aligns with Git tags/Jira epics for auditability.

Document Management

- Enables quick retrieval in repositories (e.g., Confluence, SharePoint).
- Prevents duplication with other test artifacts

Compliance

- Adheres to IEEE 829-1998 for test documentation.
- Supports QA governance and audit requirements

5.4.2.2 Test items

Test Item: IELTS Preparation Web - Version 1.0

Characteristics:

- Web-based (React frontend, Python/FastAPI backend).
- Compatible with Chrome, Firefox, Safari, Edge.
- Requires internet connectivity.

Documentation:

Requirements Specification: Functional/NFRs (e.g., NLP accuracy).

- **Design Documents**: Class diagrams, API schemas.

- **User Guides**: Student and admin manuals.

Excluded Items:
Offline functionality.

5.4.2.3. Input specifications

User Inputs:

- Full Name: "John Doe" (String, 3-50 chars)
- Email: "john.doe@ieltsweb.com" (Valid email format)
- Password: "John@1234" (8+ chars, 1 uppercase, 1 number, 1 special character)
- Selected Test Module: "Reading" (Predefined module)
- Test Attempted Answers: (Multiple-choice selection, essay typing)
- Timer control (auto-submit on timeout)

System Inputs:

- System time: Synchronized with NTP server (±5 sec tolerance)
- Database: "students" table (Empty or contains previous students)
- Test database: Loaded with questions
- Timer countdown: Set at test start

Input Relationships:

- Email must be unique (Checked against existing records)
- Password confirmation must match.

5.4.2.4. Output specifications

Test Case (Student Registration)

Primary Outputs:

- Success message: "Registration Successful" (Exact match)
- HTTP Status: 201 Created (Response within ±100ms)
- New student record in DB (Fields encrypted)
- Scorecard (Display on screen + download option)
- Test attempt record in database

Side Effects:

- Welcome email sent (Within 1 minute)
- Audit log entry for new registration

Performance Metrics:

- Auto-submit on timer expiry (Tolerance ±2 seconds)
- Result generation within 3 seconds after submission

5.4.2.5. Environmental needs

5.4.2.5.1. Hardware

Client Devices:

- Standard PC with minimum 4GB RAM
- Tablets (10" screen or above)

- Smartphones (Android/iOS compatible)

Server Requirements:

- Cloud hosting (AWS/Azure/Google Cloud)
- Minimum 8GB RAM, SSD storage
- 5 Mbps or higher stable internet connection

5.4.2.5.2. Software

System Software:

- Windows 10/11
- macOS 10.15+
- Android 10+
- iOS 14+

Browsers:

- Chrome (latest 3 versions)
- Firefox (latest ESR)
- Edge (Chromium-based)
- Safari (latest version)

Application Environment:

- React.js 12+ (frontend)
- Node.js 16.x (backend)
- MongoDB 5.0+ (database)

5.4.2.5.3. Other

Access Requirements:

- Valid admin accounts for content management
- Registered student accounts for practice tests

Special Requirements:

- Dedicated test environment separate from production
- VPN for remote testers
- Isolated test database instance

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5.4.2.6. Special procedural requirements

Authentication Tests:

- Clear browser cache and cookies before each test
- Test emails must use @ieltsweb-test.com domain
- Password reset links expire after 15 minutes (test expiry)

Practice Test Management:

- Test databases must be pre-populated with sample questions
- Timer functionality must be validated across all modules
- Mock scores must be documented separately

Learning Materials Management:

- Upload dummy files before live testing
- Confirm PDF, DOCX, MP3 file type compatibility

- Validate download speed and file integrity

Admin Dashboard Tests:

- Confirm real-time updates on student performance
- Admin role validation must be enforced
- Ensure error-free file uploads for learning content

General Requirements:

1. **Pre-test Setup**:
    - Verify database and API connectivity
    - Restart backend services before critical tests
    - Confirm user roles and permissions
2. **Data Management**:
    - Use fresh test data for each run
    - Clear residual data post-test
    - Backup important test attempt records
3. **Verification Procedures**:
    - Cross-check scorecard with answer sheets
    - Monitor email notifications after test completion
    - Check dashboard updates for admin view
4. **Security Protocols**:
    - Encrypt all stored credentials and results
    - Access to environment restricted to QA team only
5. **Post-test Cleanup**:
    - Archive test results
    - Reset any modified configurations
    - Log environment issues for review

5.4.2.7. Inter case dependencies

Test Case: TC-001 - User Registration

Field	Details
Test Case ID	TC-001
Title	User Registration
Preconditions	- User is on registration screen. - User not registered.
Steps	1. Click "Register". 2. Enter valid details. 3. Submit the form. 4. Verify email. 5. Complete verification.
Expected	Account created, email verified, redirected to login page.
Actual	Account created and verified successfully, redirected to login.
Status	Pass

Severity	High

Test Case: TC-002 - Secure Login

Field	Details
Test Case ID	TC-002
Title	Secure Login
Preconditions	- User is on login screen. - Has valid credentials.
Steps	1. Enter valid email and password. 2. Click "Login". 3. Check dashboard access.
Expected	User logged in successfully and redirected to dashboard.
Actual	User logged in and redirected.
Status	Pass
Severity	High

Test Case: TC-003 - Take Practice Tests

Field	Details
Test Case ID	TC-003
Title	Take Practice Tests
Preconditions	- User is logged in. - Tests available.
Steps	1. Navigate to "Practice Tests". 2. Select a test. 3. Complete and submit test within time.
Expected	Test submitted, evaluated, and scores displayed.
Actual	Test completed and results shown correctly.
Status	Pass
Severity	High

Test Case: TC-004 - Manage Learning Materials

Field	Details
Test Case ID	TC-004
Title	Manage Learning Materials
Preconditions	- Admin is logged in. - Upload access available.
Steps	1. Go to "Learning Materials". 2. Click "Upload New Material". 3. Upload valid file. 4. Categorize and submit.
Expected	Material uploaded successfully, users notified.
Actual	Material uploaded and users notified.
Status	Pass
Severity	Medium

Test Case: TC-005 - Update Study Materials

Field	Details
Test Case ID	TC-005
Title	Update Study Materials
Preconditions	- Admin is logged in. - Materials exist.
Steps	1. Go to "Learning Materials". 2. Select existing material. 3. Click "Edit". 4. Update content or file. 5. Save changes.
Expected	Updated material saved and users notified.
Actual	Material updated and users notified.
Status	Pass
Severity	Medium

Test Case: TC-006 - Access Learning Materials

Field	Details
Test Case ID	TC-006
Title	Access Learning Materials
Preconditions	- User is logged in. - Materials available.
Steps	1. Click "Learning Materials". 2. Browse and select a file. 3. Download the file.
Expected	File downloaded successfully.
Actual	File downloaded successfully.
Status	Pass
Severity	High

Test Case: TC-007 - Admin Dashboard

Field	Details
Test Case ID	TC-007
Title	Admin Dashboard
Preconditions	- Admin is logged in. - Admin privileges verified.
Steps	1. Log in as Admin. 2. Open "Admin Dashboard". 3. Manage users, roles, content, and settings.
Expected	Admin accesses and manages dashboard functions.
Actual	Admin accessed and managed dashboard successfully.
Status	Pass
Severity	High

5.5. Test procedure specification

5.5.1. Purpose

The purpose of the Test Procedure Specification for **IELTS Preparation Web** is to define the step-by-step instructions for executing test cases and evaluating the system's functionality. This ensures that all critical features—including user registration, secure login, practice tests, learning material access, and admin dashboard—are thoroughly verified before deployment.

5.5.2 Outline

A test procedure specification shall have the following structure:

a. Test procedure specification identifier
b. Purpose
c. Special requirements
d. Procedure steps

The sections shall be ordered in the specified sequence. Additional sections, if required, may be included at the end. If some or all of the content of a section is in another document, then a reference to that material may be listed in place of the corresponding content. The referenced material must be attached to the test procedure specification or available to users of the procedure specification.
Details on the content of each section are contained in the following sub clauses.

5.5.2.1. Test procedure specification identifier

The unique identifier for the Test Procedure Specification is "**IELTS-TPS-001**".

5.5.2.2. Purpose

A test procedure specification shall have the following structure:

a. Test procedure specification identifier
b. Purpose
c. Special requirements
d. Procedure steps

The sections shall be ordered in the specified sequence. Additional sections, if required, may be included at the end. If some or all of the content of a section is in another document, then a reference to that material may be listed in place of the corresponding content. The referenced material must be attached to the test procedure specification or available to users of the procedure specification.
Details on the content of each section are contained in the following sub clauses.

5.5.2.3. Special requirements

No special requirements are needed because manual testing will be performed. The system is user-friendly, so no special skills are necessary to execute the tests.

5.5.2.4. Procedure steps
Include the steps in 8.5.2.4.1. through 8.5.2.4.10 as applicable.

5.5.2.4.1. Log

- Maintain a log of test cases and results using Microsoft Excel or Google Sheets.
- Create separate sheets for each testing cycle.
- Organize test cases by system modules like Registration, Login, Practice Tests, Learning Materials, and Admin Dashboard

5.5.2.4.2. Set up

Steps to prepare the test environment:

- Ensure **IELTS Preparation Web** is deployed and accessible.
- Confirm database/server connectivity.
- Launch the application in a supported browser.
- Log in using valid Admin, Instructor, or Student credentials.
- Ensure that test data (e.g., test questions, learning materials) is seeded.

5.5.2.4.3. Start

To initiate testing:

- Verify environment setup (browser, DB connection, user roles).
- Open the IELTS Preparation Web platform.
- Navigate to the module under test.
- Begin executing test cases as per the test log

5.5.2.4.4. Proceed

- Execute each test case manually.
- Record observed results and note discrepancies.
- Log incidents or bugs found.
- Capture screenshots for failed scenarios.
- Update Pass/Fail status for each test case

5.5.2.4.5. Measure

System performance and response time are measured by:

- Timing login, test loading, and result generation times.
- Monitoring system response during quiz submissions and learning content loading

5.5.2.4.6. Shut down

If the test is interrupted:

- Log the event and its details.
- Notify the QA lead.
- Preserve the current state of the system and database.
- Export test logs if necessary

5.5.2.4.7. Restart

If testing needs to restart:

- Ensure the system and database are functional.
- Restore previous test data if needed.
- Re-run impacted test cases.
- Continue from the last valid checkpoint.

5.5.2.4.8. Stop

To stop testing:

- Pause testing activities.
- Inform the QA or project manager.
- Document issues and take necessary screenshots.
- Reset the system for re-execution if needed.

5.5.2.4.9. Wrap up

After completion or interruption:

- Identify any unresolved issues.
- Restore the system if necessary.
- Re-run failed test cases after fixes.
- Archive test logs, screenshots, and final reports

5.5.2.4..10. Contingencies

In case of unexpected issues:

- Log the defect with full details.
- Conduct root cause analysis.
- Collaborate with the development team for fixes.
- Prioritize and retest the affected functionality.

5.6. Test item transmittal report

5.6.1. Purpose

This report is an essential part of the testing process, as it provides clear documentation of the test items and ensures that the testing group receives the correct software item to be tested.

The Test Item Transmittal Report also includes information on the version of the IELTS Preparation Web application, associated documents, and any relevant details necessary for the testing group.

By providing this information, the Test Item Transmittal Report helps to ensure that the testing process is efficient, accurate, and reliable, ultimately contributing to the overall quality and success of the IELTS Preparation Web system..

5.6.2. Outline

A test item transmittal report shall have the following structure:

a. Transmittal report identifier
b. Transmitted items
c. Location
d. Status
e. Approvals

The sections shall be ordered in the specified sequence. Additional sections may be included just prior to Approvals. If some or all of the content of a section is in another document, then a reference to that material may be listed in place of the corresponding content. The referenced material must be attached to the test item transmittal report or available to users of the transmittal report.
Details on the content of each section are contained in the following sub clauses.

5.6.2.1. Transmittal report identifier
The unique identifier for the Test Item Transmittal Report is **"IELTS-1.0-TITR"**.

5.6.2.2. Transmitted items
Test Item is **IELTS Preparation Web Application - Version 1.0**.
All group members and the testing team are responsible for its transmittal and use during the testing phase.
The Test Item includes all the core features of the IELTS Preparation Web application such as:

- User Registration and Secure Login
- Access to Practice Tests (Listening, Reading, Writing, Speaking)
- Learning Materials Management (tips, sample answers, vocabulary lists)
- Admin Dashboard for managing users and materials
- Progress tracking and score reports for students.

5.6.2.3. Location
The test items under consideration are being transmitted to:

- Faculty of Computer Science and Software Engineering students
- Internal QA Testing Team at the University
  The IELTS Preparation Web application is accessible via:
- Web browsers (Chrome, Firefox) through the staging server URL.
- Local hosting environment for manual testing

5.6.2.4. Status

- The test items being transmitted are **ready for testing**.
- There are **no deviations** from the item documentation, previous versions, or the approved test plan.
- There are **no incident reports** pending resolution for the transmitted version.
- There are **no pending modifications** in the item documentation that could affect the transmitted items.

5.6.2.5. Approvals

Name: Muhammad Abo Bakar Aslam
Title: Project Supervisor
Date: April 28, 2025

5.7. Test log

5.7.1. Purpose

n the context of the **IELTS Preparation Web** project, the test log serves as a record of all testing activities and their results.
It provides a detailed account of the testing process, including the steps taken to execute each test case, the outcomes of each test, and any defects or issues identified during the testing.
The test log also serves as a valuable reference for future testing efforts and can be used to verify that all planned testing activities have been successfully completed.
Overall, the test log is an essential component of the testing process for the IELTS Preparation Web application, ensuring that testing activities are properly documented, results are accurately recorded, and insights are available to inform future improvements.

5.7.2. Outline

A test log shall have the following structure:

a. Test log identifier;
b. Description;
c. Activity and event entries.

The sections shall be ordered in the specified sequence. Additional sections may be included at the end. If some or all of the content of a section is in another document, then a reference to that material may be listed in place of the corresponding content. The referenced material must be attached to the test log or available to users of the log. Details on the content of each section are contained in the following sub clauses.

5.7.2.1. Test log identifier

The unique identifier for the Test Log is **"IELTS-1.0-TL"**..

5.7.2.2. Description

The log contains general information that applies to all entries unless otherwise specified in a specific log entry. The information included is:
We tested all the Test Cases of the **IELTS Preparation Web Application - Version 1.0**.
For the IELTS Preparation Web application, the test log identifies the attributes of the environments in which the testing was conducted. This includes:
Facility Identification: University of Gujrat Testing Lab / Local Testing Environment
Hardware Used: Personal Computers, Laptops (specs: Intel i5/i7, 8GB/16GB RAM)
Operating System: Windows 10 and Windows 11
Browsers: Chrome Version 124.x, Firefox Version 123.x
Database: MongoDB Atlas (Version 6.0.x)

Backend Framework: Node.js (Version 18.x)
Frontend Framework: React.js (Version 14.x)
Additional tools and software:

- Postman (for API testing)
- VS Code (for source code changes and debugging)
- This information ensures that the testing process can be accurately repeated in the same environment and that any identified issues can be properly diagnosed and resolved.

5.7.2.3. Activity and event entries

Activity and Event	Occurrence Date and Time	Author
User registers for IELTS preparation account	March 15th, 2025 - 10:00AM	M.Abdul Wahab
User logs in successfully	March 15th, 2025 - 10:10AM	M.Abdul Wahab
User attempts invalid login	March 15th, 2025 - 10:15AM	M.Abdul Wahab
User views available IELTS practice tests	March 16th, 2025 - 11:00AM	M.Abdul Wahab
User starts practice test for Reading module	March 16th, 2025 - 11:15AM	M.Ahmad
User completes Reading module practice test	March 16th, 2025 - 11:45AM	M.Ahmad
User starts practice test for Listening module	March 17th, 2025 - 9:00AM	M.Furqan
User completes Listening module practice test	March 17th, 2025 - 9:40AM	M.Furqan
User views Writing tips	March 17th, 2025 - 3:00PM	M.Abdul Wahab
User submits Writing Task 1 answer for evaluation	March 18th, 2025 - 2:00PM	M.Ahmad
User submits Writing Task 2 answer for evaluation	March 18th, 2025 - 2:30PM	M.Ahmad
User watches Speaking module preparation videos	March 19th, 2025 - 4:00PM	M.Furqan
User attempts full IELTS mock test	March 20th, 2025 - 11:00AM	M.Abdul Wahab
Admin uploads new practice material	March 21st, 2025 - 5:00PM	M.Ahmad
Admin updates Speaking sample answers	March 22nd, 2025 - 6:00PM	M.Furqan
Admin deletes outdated Reading test material	March 23rd, 2025 - 12:00PM	M.Abdul Wahab

5.7.2.3.1. Execution description

We performed all the test cases, detailed as follows:

- **M.Abdul Wahab** acted as the **Tester**.
- **M.Ahmad** served as the **Operator**.
- **M.Furqan** was the **Observer**.
- **Muhammad Abo Bakar Aslam**, the project supervisor, supervised the entire testing process.
- All group members actively participated in the testing phase.

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5.7.2.3.2. Procedure results

During our testing of the IELTS Preparation Web application:

- All test cases were executed.
- Only one minor issue was encountered: while attempting to submit a Writing Task 1 response, an unexpected error occurred due to a temporary server issue.
- This incident was recorded in the test log, along with a reference to the specific test case.
- The affected test case was marked as **unsuccessful** and further addressed later

5.7.2.3.3. Environmental information

The IELTS Preparation Web application is accessible via any modern web browser and does not require any special environmental conditions.
It runs on:

- Google Chrome, Firefox (latest versions)
- Windows 10/11, Mac OS
- Internet connection with basic bandwidth Thus, no specific environmental conditions were necessary to record for the test log entries

5.7.2.3.4. Anomalous events

An anomalous event occurred during the testing:

- A user submitted a Writing Task 1 answer, but the server displayed an error message ("Submission Failed") despite a stable internet connection.
- Further investigation revealed that the backend server was temporarily unreachable due to scheduled maintenance.
- This event was recorded in the test log with full details for future analysis and to prevent similar occurrences.

5.7.2.3.5. Incident report identifiers

The unique identifier for the Incident Report is **"IELTS-1.0-IRI"**.

5.8. Test incident report

5.8.1. Purpose

The purpose of an incident report during manual testing is to document any unexpected or undesirable behavior that occurs during testing. The incident report provides a detailed account of the issue encountered, including the steps taken to reproduce it, the expected outcome, and the actual outcome. By documenting these incidents, the testing team can track and prioritize issues to ensure they are addressed before the application is released.

5.8.2. Outline

A test incident report shall have the following structure:

a. Test incident report identifier
b. Summary
c. Incident description
d. Impact

The sections shall be ordered in the specified sequence. Additional sections may be included at the end. If some or all of the content of a section is in another document, then a reference to that material may be listed in place of the corresponding content. The referenced material must be attached to the test incident report or available to users of the incident report.
Details on the content of each section are contained in the following sub clauses.

5.8.2.1. Test incident report identifier

The unique identifier for the Incident Report is **"IELTS-1.0-IRI"**...

5.8.2.2. Summary

During the testing of the IELTS Preparation Web application, an incident was observed while submitting the Writing Task 1 answer.

- The system displayed an error message: **"Submission Failed"** despite valid input and stable internet connection.
- The version of the system under testing was **Version 1.0**.
- The related documents referenced are:
    - Test Case Specification: **TCS-Writing-Submit**
    - Test Log Reference: **LOG-2025-WR-18**

5.8.2.3. Incident description

Inputs:
A Writing Task 1 text submission entered by the user via the Writing module interface.
Expected Results:
The application should have successfully saved the user's response to the backend database and displayed a "Submission Successful" confirmation message.
Actual Results:
Instead of successful submission, the user was shown an error message: **"Submission Failed"**.
Anomalies:

- Submission failure despite correct operation.
- Backend server became temporarily unreachable.

Date and Time:
March 18th, 2025 – 2:00PM
Procedure Step:
Step 5 – Submit the Writing Task 1 response after completing the writing attempt.
Environment:
- Web browser: Google Chrome Version 123.0
- Operating System: Windows 11
- Internet Connection: Stable (100 Mbps)

Attempts to Repeat:
- A second submission attempt immediately after the first resulted in the same failure.
- A third attempt after 10 minutes succeeded, indicating temporary backend downtime.

Testers:
M Abdul Wahab
Observers:
M Furqan
Additional Observations:
- No client-side errors were found in the browser console.
- The Firebase database server was found temporarily down due to scheduled maintenance during that period.

5.8.2.4.Impact
- The **Writing Submission** test case was marked as unsuccessful during the first round of testing.
- Retesting was scheduled after the maintenance window.
- No changes were required in the test design specifications.
- The incident highlighted the importance of checking backend server status before starting testing sessions.
- It suggested adding a **server status check feature** in future versions to enhance user experience and reduce unexpected failures.

5.9. Test summary report

5.9.1. Purpose
The Test Summary Report for the **IELTS Preparation Web** provides a consolidated overview of all testing activities, results, and quality assessments. This document:
- Communicates testing outcomes to developers and stakeholders.
- Serves as a reference for future testing cycles.
- Ensures all critical tests are completed before production release.

5.9.2. Outline
A test summary report shall have the following structure:
a. Test summary report identifier
b. Summary

c. Variances
d. Comprehensive assessment
e. Summary of results
f. Evaluation
g. Summary of activities
h. Approvals

Details on the content of each section are contained in the following sub clauses.

5.9.2.1. Test summary report identifier
The unique identifier for the Incident Report is **"IELTS-1.0-TSR"**.
5.9.2.2. Summary
Test Item: IELTS Preparation Web - Version 1.0
Environment:
- Browsers: Chrome (v123), Firefox (v121), Safari (v17).
- Backend: Python/FastAPI, Firebase database.
- Network: Stable (100 Mbps).

References:
1. IELTS-1.0-TPDS (Test Plan/Design Specification)
2. IELTS-1.0-TIR (Test Incident Report)
3. IELTS-1.0-TL (Test Log)

5.9.2.3. Variances
- **Planned vs. Actual**:
  - **Excluded**: Advanced NLP model fine-tuning (deferred to Phase 2).
  - **Added**: Additional edge-case tests for Writing Task submissions due to incident IELTS-1.0-IRI.
- All other tests aligned with the original test plan.

5.9.2.4. Comprehensiveness assessment
- **Coverage**: 100% of functional requirements (per traceability matrix).
- **Untested Features**:
  - Offline mode (explicitly excluded).
  - Localization (future phase).
- **Risk Areas**:
  - NLP accuracy (benchmarked against 50 human-graded samples).
  - Cross-browser compatibility (Chrome/Firefox/Safari).

5.9.2.5. Summary of results

Test Category	Passed	Failed	Resolution
User Authentication	28/28	0	-
Practice Tests (UI)	45/45	0	-
NLP Evaluation	32/35	3	Fixed model thresholds
Admin CMS	20/20	0	-

Notifications	15/15	0	-

Key Incident:
IELTS-1.0-IRI: Writing Task submission failure (resolved after backend maintenance).

5.9.2.6. Evaluation

- **Success Criteria Met**:
  - All critical functionality validated.
  - 98% test case pass rate (3/150 failures resolved).
- **Failure Risk**: Low (isolated to edge cases).
- **Recommendation**: Ready for production release with monitoring for NLP accuracy.

5.9.2.7. Summary of activities

Testing Activity	Staff	Machine Time	Elapsed Time
Test Plan/Design Specification	Developers, QA Team	3 Weeks	1 Month
Test Case Specification	QA Manager	2 Weeks	3 Weeks
Test Execution	QA Team	4 Weeks	6 Weeks
Incident Resolution	Developers, QA Team	1 Week	2 Weeks
Report Compilation	QA Manager	1 Week	1 Week

5.9.2.8. Approvals

Name: Muhammad Abo Bakar Aslam
Title: Project Supervisor
Date: April 28, 2025