SOFTWARE REQUIREMENTS SPECIFICATIONS

FOR

STUDENT DATA VISUALIZATION

VERSION 1.0

PREPARED BY

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1. Introduction

The **Student Details Visualisation and Report Project** is designed to serve as a centralized repository for tracking student participation in various academic and extracurricular activities. The system will facilitate efficient data storage, retrieval, and reporting, ensuring that institutions can streamline administrative processes and maintain comprehensive student records. This system is particularly useful for accreditation purposes, allowing institutions to present well-structured reports of student achievements and engagements.

By integrating user-friendly interfaces and advanced data management capabilities, the system will enable students, faculty, and administrators to access relevant information quickly. Key functionalities include event participation tracking, placement record management, faculty research integration, and automated reporting. Additionally, security measures such as role-based access and authentication will be implemented to protect sensitive data.

The system aims to improve data consistency and accessibility while reducing manual workload, making it an indispensable tool for educational institutions.

1.1 Purpose

This document defines the software requirements for a **Student Details Visualisation and Report**. The system aims to provide a **centralized database** for storing and managing student participation in curricular and co-curricular activities. It is designed to assist institutions in efficiently tracking student achievements for **accreditation and administrative purposes**. The document serves as a foundation for the development process, ensuring that all stakeholders have a shared understanding of the project scope and objectives.

1.2 Document Purpose and Scope

The **Student Details Visualisation and Report** will provide functionalities for:

- **Storing and retrieving** student records, including event participation, internships, placements, and memberships.
- **Importing data** from existing databases to ensure a smooth transition.
- **Tracking student involvement** in technical, cultural, and sports-related activities.
- **Generating reports** to assist in accreditation and institutional record-keeping.
- **Providing a user-friendly interface** for students, faculty, and administrators.

This document outlines the functional and non-functional requirements necessary for the development of the system, ensuring consistency in data storage, retrieval, and management.

1.3 Intended Audience

The intended users of this document include:

- **Developers and Engineers**: For implementing the required functionalities.
- **Institutional Administrators**: For understanding how the system will manage student records.
- **Accreditation Bodies**: To ensure compliance with documentation and reporting standards.
- **UI/UX Designers**: To create an intuitive interface based on the defined requirements.
- **Students and Faculty**: As primary users of the system for inputting and managing data.

1.4 Document Convention

 This document follows the IEEE formatting requirements.

1.5 References and Acknowledgement

- https://medium.com/@growsolutions/functional-and-non-functional-requirements-the-ultimate-checklist-with-examples-cde16aba33d7
- **IEEE** – Referenced **IEEE Std 830-1998**, *IEEE Recommended Practice for Software Requirements Specifications*, IEEE Computer Society, 1998.

2. Functional Requirements

2.1 User Authentication & Access Control

- The system shall provide **secure login** for administrators.
- The system shall implement **password encryption** and allow password recovery via email verification.

2.2 Search & Filtering

- The system shall provide **advanced search options** based on:
  - Batch, department
  - Event type (technical, cultural, sports)
  - Internship/placement status
- The system shall provide **filters** for viewing different participation records.

2.3 Dashboard & Reports

- The system shall display a **dashboard** with key **admin** details:
  - Total student count, placement status, report generation etc.
- The system shall allow **automatic report generation** for accreditation purposes in **PDF/Excel formats**.

2.4 Data Visualization & Analytics

- The system shall provide **graphical dashboards** showing:
  - Student participation trends in events.
  - Placement statistics by batch, department, and company.
  - Membership distributions in professional societies.
- The system shall allow **customized data reports** based on selected filters.

2.5 Notifications & Alerts

- The system shall send **email/SMS notifications** for:
  - **New Features & System Updates**: Notifications when a new feature is introduced in the system.
  - **New Graphs & Reports**: Alerts when a new graphical analysis or report is generated in the dashboard.
  - **New Data Availability**: Notifications when faculty publications, placement statistics, or event details are updated.

2.6 System Integration & Data Export

- The system shall allow **importing student data** from existing institutional databases.
- The system shall support **exporting data** in multiple formats (Excel, CSV, PDF).
- The system shall integrate with **faculty publication databases** to suggest research paper titles for students.

2.7 Security & Data Integrity

- The system shall implement **admin verification** before allowing students to add details.
- Sensitive data will be encrypted to prevent unauthorized access

2.8 Future Scope Enhancements

AI-Powered Trend Prediction for Student Participation:

- The system shall use **machine learning (ML) models** to analyze student participation patterns in **technical, cultural, and placement activities**.
- It shall predict **which types of events will gain popularity** based on historical participation data.

Predictive Analytics for Placements & Internships:

- The system shall use **AI-based career trajectory analysis** to predict:
  - **Success rates** of students in placements based on skill sets and past performance.
  - **Companies likely to hire** students from specific departments.
  - **Internship conversion rates** into full-time offers.

AI-Driven Academic & Research Trends Prediction:

- The system shall analyze **faculty publications, student research interests, and global academic trends** to suggest emerging research areas.
- It shall provide **personalized research topic recommendations** based on a student's academic performance and interests

3. NON-FUNCTIONAL REQUIREMENTS

3.1 Performance Requirements

- The system shall efficiently handle a **large number of concurrent users** without performance degradation.
- The system shall ensure that **data retrieval operations**, such as searching student details and generating reports, are **fast and seamless** for users.
- The system shall allow **fast and flexible data export** in multiple formats, including **PDF, Excel, and CSV**, ensuring easy accessibility and sharing of reports.
- The system shall enable **customized exports**, allowing users to filter and extract specific student records, event details, or reports based on their needs.

3.2 Security Requirements

- **Data Encryption:** All sensitive information will be **encrypted both at rest and in transit** to prevent unauthorized access or breaches.
- **Authentication & Authorization:** The system will enforce **secure login mechanisms**

3.3 Software Quality Attributes

- **Reliability:** The system shall function **consistently** without failures, ensuring **high availability** and accurate data retrieval at all times.
- **Security:** The system shall implement **strong encryption, authentication mechanisms, and access controls** to protect user data from breaches.
- **Usability:** The system shall provide an **intuitive, user-friendly interface** that is easy to navigate for administrators.
- **Performance Efficiency:** The system shall execute all operations, such as **data retrieval,exports, and analytics, in a fast and responsive manner**.
- **Maintainability:** The system shall be **modular and well-documented**, allowing for easy updates, bug fixes, and enhancements in the future.

4. Use Case Scenarios for Student Visualization & Reporting System

Use Case 1: User Registration

Actors:Faculty, Administrator,Student

Description:

Allows new users to register and create an account before accessing the system.

Preconditions:

- The user must not already have an existing account.
- The user must have a valid **email ID** and required credentials.

Main Flow:

1. The user navigates to the **Registration Page**.
2. The user enters the required details:
   - Name
   - Email ID
   - Password
3. The system **validates the input fields**.
4. The system **activates the account** and redirects the user to the login page.

Postconditions:

- The user's account is successfully created and **ready for login**.

Exceptions:

- **Invalid or missing details** → Prompt user to correct errors.
- **Email already in use** → Display an error message.

Use Case 2: User Login & Authentication

Actors:Faculty, Administrator,Student

Description: Allows users to securely log into the system based on their roles.

Preconditions:

- The user must be **registered** in the system.
- The user must have valid **credentials (username/email and password)**.

Main Flow:

1. The user navigates to the **Login Page**.
2. The user enters their **email/username and password**.
3. The system **validates the credentials**:
   - If valid, the system grants access to the **respective dashboard** based on the user role.
   - If invalid, the system displays an **error message** and prompts the user to retry.

Postconditions:

- The user is **authenticated** and directed to the appropriate **dashboard**.

Exceptions:

- **Incorrect credentials** → Display an error message with a retry option.
- **Multiple failed attempts** → Temporarily lock the account and send a security alert.
- **Forgot password** → User can request a **password reset via email verification**.

Use Case 3: Viewing Student Analytics Dashboard

Actors : Faculty, Administrator

Description: Allows users to access an interactive dashboard displaying student reports.

Preconditions:

- **The user must be logged in.**

Main Flow:

1. **The user navigates to the dashboard.**
2. **The system fetches and displays key statistics (total students, placement rate, participation trends, publications).**
3. **The user can view charts and graphs representing student data visually.**
4. **The user can switch between different views (bar charts, pie charts, line graphs).**

Postconditions:

- **The dashboard displays real-time student statistics dynamically.**

Exceptions:

- **No data available → Display a placeholder message.**

Use Case 4: Applying Data Filters

Actors: Faculty, Administrator,Student

Description: Allows users to filter student data based on department, batch, event type, and date range.

Preconditions:

- **The user must have access to the filters section.**

Main Flow:

1. **The user selects filters such as department, batch, date range, and event type.**
2. **The user clicks on "Apply Filters".**
3. **The system updates graphs and charts based on the selected criteria.**
4. **The system displays filtered statistics dynamically.**

Postconditions:

- **The user sees customized student analytics based on selected filters.**

Exceptions:

- **Invalid filter selection → Display a notification.**

Use Case 5: Exporting Reports

Actors: Administrator, Faculty

Description: Allows users to export filtered student analytics into different formats.

Preconditions:

- **The user must have access to the export function.**

Main Flow:

1. **The user selects a report format (PDF, Excel, CSV).**
2. **The user clicks on "Export".**
3. **The system generates and downloads the report.**

Postconditions:

- **The user obtains a well-formatted report containing the requested data.**

Exceptions:

- **No data available → Display an error message.**

Use Case 6: Switching Between Chart Types

Actors: Faculty, Administrator,Student

Description: Allows users to change the visualization type for better insights.

Preconditions:

- **The user must be on a page with interactive charts.**

Main Flow:

1. The user selects a chart type (bar, pie, line, or doughnut).
2. The system updates the chart dynamically.
3. The user views the new chart representation.

Postconditions:

- The chart updates to reflect the new visualization format.

Exceptions:

- Chart rendering error → Display a default view.

Use Case 7: Tracking Placement Statistics

Actors: Faculty, Administrator,Student

Description: Allows users to track student placements by company and batch.

Preconditions:

- Placement data must be available.

Main Flow:

1. The user selects a batch year or specific company.
2. The system updates the placement statistics graph.
3. The user views trends and patterns in recruitment.

Postconditions:

- The system provides placement insights for analysis.

Exceptions:

- No placement data available → Display a message.

Use Case 8: Analyzing Event Participation Trends

Actors: Faculty, Administrator,Student

Description: Allows users to analyze student participation in co-curricular and technical events.

Preconditions:

- **Event participation data must be available.**

Main Flow:

1. **The user selects an event category (technical, cultural, sports).**
2. **The system updates the participation trend graph.**
3. **The user views statistics such as most popular events and attendance rates.**

Postconditions:

- **The user gains insights into student engagement in activities.**

Exceptions:

- **No participation data → Show an alternative message.**

Use Case 9: Monitoring Faculty Publications & Research Trends

Actors: Faculty, Administrator

Description: Allows faculty to track research publications and trends.

Preconditions:

- **Publication data must be available.**

Main Flow:

1. **The user selects a publication type (journal, conference).**
2. **The system updates the publication trend graph.**

3. The user sees insights into faculty research output over time.

Postconditions:

- The system provides real-time research analytics.

Exceptions:

- No publication data → Show a placeholder message.

Use Case 10: Professional Society Membership Analysis

Actors:Administrator, Faculty ,Student

Description: Allows users to analyze student memberships in professional societies (IEEE, ACM, etc.).

Preconditions:

- Membership data must be available.

Main Flow:

1. The user selects a society (IEEE, ACM, IET, etc.).
2. The system updates the membership trend chart.
3. The user gains insights into student involvement in professional organizations.

Postconditions:

- The system provides membership distribution statistics.

Exceptions:

- No membership data available → Display a message.

USE CASE DIAGRAM:

Student Details Management System

- Analyzing Event Participation Trends
- Professional Society Membership Analysis
- User Registration
- User Login & Authentication
- Applying Data Filters
- Switching Between Chart Types
- Tracking Placement Statistics
- Monitoring Faculty Publications & Research Trends
- Exporting Reports
- Viewing Student Analytics Dashboard

Actors: Student, Faculty, Administrator