### **Non-Functional Requirements**

#### **Maintainability**

* **Consistent Coding Standards:**The project’s code will adhere to strict coding standards. For instance, variable names will follow camelCase conventions, and API endpoints will use lower-case with hyphens or underscores consistently. Clear commenting is required, with at least 40% of the code lines documented.
* **Modular Architecture:** The codebase will be divided by functionalities such as TA Task Management, Proctoring, Leave Management, Reporting, and System Configuration. This modular approach ensures that individual components can be updated or replaced without affecting the entire system.
* **Rigorous Testing:** Individual functions and modules will be tested both in isolation and after integration. End-to-end testing will simulate typical user workflows to reduce unexpected errors. All anticipated errors will be handled gracefully, with appropriate error pages or notifications displayed to the user.
* **Readable Structure:** Code organization will be enforced by placing UI components in a dedicated “components” folder and page layouts in a “pages” folder, with uniform indentation (e.g., 4 spaces per indent). This consistent structure will ensure that the code is easily maintainable by all team members.

#### **Usability**

* **User-Centric Design:** The TA Management System will feature a clean, intuitive user interface to simplify task submissions, leave requests, and proctoring assignments. Interactive elements (such as buttons and menus) will have subtle animations triggered on hover or click to provide immediate visual feedback.
* **Accessibility:** The interface will be designed to be accessible, including support for multiple languages (e.g., English and Turkish) so that all users can navigate the system comfortably.
* **Streamlined Workflows:** User interactions such as task assignments, leave requests, and exam definitions are designed to require minimal steps. This simplicity will reduce user errors and enhance overall productivity.

#### **Reliability**

* **Robust Error Handling:**Critical operations (task deletions, leave approvals, assignment overrides) must handle errors gracefully, logging errors automatically and attempting immediate recovery within 2 seconds.
* **Data Integrity:** All operations interacting with the MySQL database will ensure data consistency, employing transactions where needed, so that TA workloads, assignments, and reports are accurate and reliable.
* **Resilience:** Even in the event of unexpected errors or server issues, the system will provide informative error messages and redirect users to safe fallback pages to prevent data loss or system crashes.

#### **Performance**

* **Response Time:** The application is expected to have a response time of under 5 seconds for most user interactions, ensuring a smooth experience even during complex operations like automatic proctor assignment and real-time report generation.
* **Scalability:** The system must scale efficiently to support a growing number of users and data entries. It is designed to handle concurrent interactions from multiple TAs, instructors, and administrative staff without performance degradation.
* **Load Handling:** The application must efficiently manage heavy loads—such as processing multiple simultaneous exam definitions, TA task updates, and leave requests—ensuring that even during peak periods (e.g., semester start or exam scheduling), performance remains optimal.
* **Availability:** System availability shall be at least 99.5%, with clear maintenance windows defined outside peak operational hours.

#### **Security**

* **Data Encryption:**

All sensitive data (personal information, assignment data, reports) must be encrypted at rest and in transit using AES-256 and HTTPS/TLS.

* **Authentication:**

System access must use email/password authentication for standard users, and Multi-Factor Authentication (MFA) for admin users and critical operations.

* **Access Control:**

Implement Role-Based Access Control (RBAC) clearly distinguishing permissions for TA, Staff, Dean, and Admin roles.

* **Auditability:** All critical actions must be logged comprehensively with timestamps and user identifiers.

#### **Portability and Compatibility**

* **Cross-Browser Compatibility:** The system must support current versions of Chrome, Firefox, Safari, and Edge browsers.
* **Device Compatibility:** The system shall be fully responsive, maintaining functionality and usability on desktop platforms.

#### **Auditability and Logging**

* **Comprehensive Logging:**

All significant user actions (assignments, proctor swaps, leave requests, administrative modifications) shall be logged in detail.

* **Audit Trails:**

Provide clear, timestamped audit trails for all sensitive and administrative actions for regulatory compliance and incident investigations.

#### **Compliance Requirements**

* **Data Protection Compliance:**

The system must adhere strictly to Turkish data protection regulations (KVKK) and international standards (GDPR) regarding the handling of personal data.

* **Accessibility Compliance:**

System design shall comply with WCAG 2.1 AA guidelines for accessibility to ensure inclusivity.