**CS-255 System Analysis And Design**

**Module 2 Assignment**

**Functional and Nonfunctional Requirements in Designing an LMS**

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**Functional and Nonfunctional Requirements for a Learning Management System**

# **Functional Requirements**

| **Functional Requirement** | **Rationale for Requirement** | **Source(s), APA format** |
| --- | --- | --- |
| Role-Based Access & Account Management | An LMS must differentiate permissions for students, faculty, TAs, and admins to protect data and enable appropriate capabilities (e.g., grading vs. viewing). This is foundational to security and the correct operation of course workflows. | Blackboard privacy guidance emphasizes configuration to meet FERPA obligations, implying role-appropriate controls.  *(Blackboard Help, n.d.)* |
| Course Content Delivery & Organization | Instructors must upload, organize, and schedule course materials (modules, pages, files, videos) so students can access learning content both asynchronously and synchronously. This is the LMS’s primary instructional function. | General LMS capability informed by vendor documentation across platforms.  *(Author’s analysis based on LMS practices)* |
| Assessments, Quizzes, Assignments & Gradebook | The LMS must allow instructors to create assessments, collect submissions, automatically or manually grade, and publish grades securely; these functions are essential for teaching and accreditation. | Common feature across modern LMSs: Blackboard FERPA emphasis on secure grade handling.  *(Blackboard Help, n.d.)* |
| Communication & Collaboration Tools (announcements, messaging, discussions) | Students need timely updates and spaces to collaborate; instructors need reliable channels to guide learning and foster engagement. | Common LMS capability.  *(Author’s analysis based on LMS practices)* |
| Standards-Based Integrations via LTI 1.3/Advantage | To plug in proctoring, publisher content, simulations, and custom tools, the LMS should support **IMS Global (1EdTech) LTI 1.3** with OIDC security. This future-proofs the platform and avoids vendor lock-in. | Canvas documents LTI 1.3 and its OIDC-based security model, reflecting standard LMS practice.  *(Instructure, n.d.-a; Instructure, n.d.-b)* |
| Backup & Restore of Courses and Site Data | Regular backup and reliable restore minimize downtime and data loss from errors or incidents, and support rollover between terms. | MoodleDocs recommends site-level backups to shorten recovery time and preserve all data; restore capabilities are built in.  *(MoodleDocs, 2024; MoodleDocs, 2025)* |

# **Nonfunctional Requirements**

| **Nonfunctional Requirement** | **Rationale for Requirement** | **Source(s), APA format** |
| --- | --- | --- |
| Accessibility: WCAG 2.1 AA Conformance | To serve diverse learners equitably (screen readers, keyboard navigation, captions), the LMS UI and content experiences should meet **WCAG 2.1 AA** at a minimum. | W3C WCAG 2.1 standard overview and conformance levels.  *(W3C, 2025; W3C WAI, n.d.)* |
| Security & Compliance (FERPA/GDPR-aware; ISO/IEC 27001 controls) | Protecting student PII, grades, and coursework requires robust security controls and alignment with education privacy laws; ISO/IEC 27001 frameworks help institutionalize security practices. | D2L highlights ISO/IEC 27001 alignment; Blackboard describes configurations that support FERPA.  *(D2L, n.d.; Blackboard Help, n.d.)* |
| Performance/Capacity | The system must remain responsive at peak times (e.g., submission deadlines, exams) and support thousands of concurrent users globally to avoid timeouts and frustration. | General NFR best practice for LMS scale.  *(Author’s analysis based on NFR best practices)* |
| Availability & Disaster Recovery | Courses run 24/7 across time zones; high uptime plus defined RTO/RPO ensures continuity. Backups (see Functional #6) underpin disaster recovery. | MoodleDocs emphasizes backup frequency to speed recovery.  *(MoodleDocs, 2025)* |
| Scalability (Cloud-Ready, Global Delivery) | Enrollment and content integrations grow over time; horizontal/elastic scaling ensures a stable experience during term starts and finals. | General NFR principle; widely expected for modern LMS.  *(Author’s analysis based on NFR best practices)* |
| Usability | Clear navigation, consistent UI patterns, and informative feedback reduce cognitive load, improving learning outcomes and lowering support burden. WCAG practices also improve general usability. | WCAG’s POUR principles (perceivable, operable, understandable, robust) connect accessibility to overall usability.  *(W3C WAI, n.d.)* |

# **Assumptions**

| **Assumption** | **Rationale for Requirement** | **Source(s), APA format** |
| --- | --- | --- |
| Institutional SSO is Available (SAML/OIDC) for Identity & Access | Most universities provide centralized identity providers; integrating SSO reduces password fatigue and strengthens security for all roles. LTI 1.3 also relies on OIDC flows, indicating an OIDC-friendly environment. | Canvas LTI overview references OIDC security.  *(Instructure, n.d.-a)* |
| Reliable Student/Faculty Internet & Modern Browsers/ Devices | A cloud LMS requires a consistent internet connection and standards-compliant browsers for media, assessments, and real-time features. | Common operational assumption for online programs.  *(Author’s analysis based on online program standards)* |

# **Limitations**

| **Limitation** | **Rationale for Requirement** | **Source(s), APA format** |
| --- | --- | --- |
| Third-Party Tool Risk (via LTI) & Vendor Roadmaps | While LTI expands capability, the LMS inherits availability, privacy, and UX constraints from external tools; not all tools reach the same accessibility/compliance bar. | LTI is the integration path; quality varies by tool provider.  *(Instructure, n.d.-b)* |
| Compliance Landscape Varies by Jurisdiction | The LMS can support FERPA/GDPR-aware configuration, but ultimate compliance depends on institutional policies and correct configuration; some  obligations lie outside the LMS’s direct control. | Blackboard notes product support for FERPA, while institutions must configure it to their policies.  *(Blackboard Help, n.d.)* |

# **Acronyms and Full Forms**

* **1EdTech** – The new name for IMS Global Learning Consortium, which develops learning technology standards such as LTI.
* **A11y** – Accessibility (short form where “11” represents the 11 letters between “A” and “y”).
* **APA** – American Psychological Association (citation and formatting style).
* **D2L** – Desire2Learn (the company behind Brightspace LMS).
* **FERPA** – Family Educational Rights and Privacy Act (U.S. law protecting student education records).
* **FERPA/GDPR-aware** – Refers to systems configured to comply with both U.S. (FERPA) and EU (GDPR) data privacy rules.
* **GDPR** – General Data Protection Regulation (European Union law on data privacy and protection).
* **IMS Global** – Instructional Management Systems Global Learning Consortium (now called **1EdTech**; the standards body that created LTI).
* **ISO/IEC 27001** – International Standard for Information Security Management Systems (ISMS).
* **LMS** – Learning Management System.
* **LTI** – Learning Tools Interoperability (a standard for integrating external tools into an LMS, developed by IMS Global).
* **NFR** – Nonfunctional Requirement (system quality attributes, like performance, scalability, usability).
* **OIDC** – OpenID Connect (an identity layer on top of OAuth 2.0 for secure authentication).
* **PII** – Personally Identifiable Information (any data that can identify an individual, like name, SSN, student ID).
* **RPO** – Recovery Point Objective (the maximum acceptable data loss measured in time, e.g., “15 minutes of lost data”).
* **RTO** – Recovery Time Objective (how quickly a system must be restored after a failure).
* **SAML** – Security Assertion Markup Language (an open standard for exchanging authentication/authorization data, often used in SSO).
* **SNHU** – Southern New Hampshire University.
* **SSO** – Single Sign-On (a login solution allowing access to multiple systems with one set of credentials).
* **TA** – Teaching Assistant.
* **UI** – User Interface (the visual/interactive part of a system where users interact).
* **UX** – User Experience (the overall experience and satisfaction of a user interacting with the system).
* **W3C** – World Wide Web Consortium (the main international standards organization for the web).
* **WCAG** – Web Content Accessibility Guidelines (rules for making web content accessible to people with disabilities).

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