NEXA: An Integrated LMS (Learning Management System) With Modern Learning

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Abstract: *In today's rapidly evolving digital education landscape, institutions require robust platforms that not only manage academic processes but also enhance user engagement and simplify administrative tasks. To meet these demands, we present NEXA, a fully integrated and modular Learning Management System (LMS) developed using the MERN stack—MongoDB for scalable data storage, Express.js and Node.js for backend services, and React.js for a dynamic and responsive frontend interface. NEXA is designed to support five core modules: user authentication, course management, attendance tracking, assessments, and certification. Unlike conventional LMS platforms, NEXA offers a unified interface that is both intuitive and role-specific, supporting seamless interactions for students, instructors, and administrators. OAuth 2.0 is employed to ensure secure, token-based login and role-based access control across the system.*

Each module is developed to function independently while remaining tightly coupled within the overall system architecture. The Course Management module allows instructors to create and modify course content using CRUD operations, while students can browse, enroll in, and track course progress. The Attendance Module logs session-based participation using time-stamp logic, enabling real-time monitoring and reporting. The Assessment Module provides interactive quizzes and assignments, which are auto-evaluated using pattern-matching algorithms, delivering immediate feedback to students and reducing grading overhead for instructors. These features promote continuous academic tracking and data-driven insights. All data transactions are securely stored and handled through MongoDB, ensuring consistency and fast retrieval.

Upon successful completion of a course, students receive digitally verifiable certificates issued through the Digital Signature Algorithm (DSA), enhancing authenticity and credibility. The system's modular design not only simplifies future upgrades and customization but also allows deployment across various scales—from single-classroom implementations to institution-wide rollouts. With its responsive user interface, real-time data processing, and secure architecture, NEXA stands as a comprehensive, adaptable solution for educational institutions and training centers seeking to modernize their teaching and learning ecosystem.

Keywords: Learning Management System, MERN stack, course management, attendance tracking, automated assessment, digital certification, OAuth 2.0, educational technology, modular architecture, user engagement

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