
1. Functional Requirements

1.1 User and Role Management

The system shall support granular role-based access control with at minimum the following roles. Additional roles may be configured by the System Administrator.

Role	Key Permissions
System Administrator	Full access, system configuration, user management, and audit logs
Principal / Director/Professor	Read-all, approval workflows, and MIS dashboards
Faculty / Instructor	Course management, attendance, marks entry, and content upload
Trainee	Enrolment, learning content access, self-assessment, and feedback
Batch Coordinator	Batch scheduling, timetable management, rosters
Librarian	Catalogue, issue/return, e-library management
Hostel Warden	Room allocation, check-in/out, housekeeping, and billing
Accounts / Finance	Billing reports, payment reconciliation
HR / Training Admin	Trainee records, certificates, and nomination management

1. The system shall authenticate users via username/password with enforced password policies (minimum length, complexity, expiry).
2. The system shall support Single Sign-On (SSO) integration with NHSRCL Active Directory / LDAP.
3. The system shall maintain a complete audit trail of all user actions with timestamps.
4. Bulk user import/export via Excel/CSV shall be supported.

1.2 Trainee Management

1.2.1 Registration and Enrolment

1. Online registration portal for trainees with profile creation (personal details, designation, department, sponsoring organisation, photograph, ID proof upload).
2. Nomination management — sponsoring organisations/departments may nominate trainees through the portal; nominations require an approval workflow.
3. Batch allocation based on course, capacity, prerequisites, and start date.
4. Unique trainee ID generation with barcode/QR code for physical access and library use.
5. Pre-training prerequisite verification and gap-analysis tracking.

1.2.2 Trainee Lifecycle

1. End-to-end trainee lifecycle management: registration → induction → training → assessment → certification → alumni.
 2. Training history maintained permanently per trainee; accessible by authorised roles.
 3. Support for multi-course enrolment; prerequisites auto-checked before enrolment.
 4. Trainee status tracking: Active, On-Leave, Completed, Withdrawn, Deferred.
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1.2.3 Attendance Management

1. Digital attendance marking per session by faculty; manual override with reason logging.
2. Biometric / QR-code / RFID-based attendance integration support.
3. Minimum attendance threshold configuration per course; automatic alerts to trainee and coordinator when attendance falls below threshold.
4. Leave application and approval workflow (online); leave deducted from attendance.
5. Attendance reports: daily, weekly, monthly, course-wise, trainee-wise.
6. Loss of Learning
7. Course cover-up

1.3 Physical Class and Session Management

This is the primary focus of the system. HSTRl conducts instructor-led training, practical/lab sessions, workshops, field visits, and seminars. All physical training activities must be comprehensively managed.

1.3.1 Course and Curriculum Management

1. Creation and management of a course catalogue with course code, name, description, duration, prerequisites, target audience, and learning objectives.
2. Curriculum builder — define syllabus modules, sessions (lecture, practical, lab, field visit), session duration, and sequence.
3. Version control for curricula; previous versions archived and traceable.
4. Bulk course upload via Excel template.
5. Module creation

1.3.2 Batch and Timetable Management

1. Create batches with defined start/end dates, capacity, assigned faculty, and classroom.
2. Automated and manual timetable generation with conflict detection (faculty, room, resource clashes).
3. Timetable published to trainees and faculty via portal and email/SMS notification.
4. Timetable modification with automatic cascade notifications.
5. Holiday and institute calendar integration.
6. Support for multiple concurrent batches with independent timetables.

1.3.3 Classroom and Resource Booking

1. Real-time classroom, laboratory, simulator, and equipment booking calendar.
2. Room capacity and resource availability are displayed during scheduling.
3. Booking conflict alerts and alternative suggestions.
4. Equipment/training aid request and allocation linked to sessions.

1.3.4 Faculty and Guest Lecturer Management

1. Faculty profiles with qualifications, specialisations, and training history.
 2. Faculty allocation to sessions with workload tracking.
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3. Guest lecturer invitation management: invitation letter generation, confirmation tracking, travel/accommodation requests.
 4. Faculty availability calendar; auto-alert on scheduling conflicts.

1.3.5 Session Execution and Tracking

1. Session commencement logging by faculty (start time, topic covered, actual planned vs actual delivered % deviations from plan).
2. Digital session diary/lesson plan upload per session.
3. Real-time session progress dashboard for batch coordinators and the Principal.
4. Make-up class scheduling for missed sessions.

1.4 Competency Management

The objective of this is to manage employee competencies, conduct assessments, perform gap analysis, and enable training and development planning across the organization.

1.4.1 Competency Framework Management

1. The system shall support the creation and management of:
 - a. Technical, functional, and behavioral competencies
2. Define proficiency levels and grading scales
3. Map competencies to job roles and departments
4. Provide version control and bulk upload functionality

1.4.2 Job Role & Competency Mapping

1. Define job roles with required competencies and proficiency levels
2. Map employees to job roles
3. Maintain role-wise competency matrices

1.4.3 Competency Assessment

1. Support multiple assessment types:
 - a. Self, Manager, and Third-party assessments
2. Provide configurable question banks and scoring mechanisms
3. Enable workflow-based assessment approvals
4. Maintain complete audit trail

1.4.4 Gap Analysis

1. The system shall automatically compute competency gaps by comparing:
 - a. Required vs available competency levels
2. Generate:
 - a. Individual gap reports
 - b. Role-wise and department-wise gap analysis
3. Classify gaps based on severity levels
4. Provide real-time updates on gap status

1.4.5 Training & Development

1. Recommend training programs based on identified gaps
2. Integrate with LMS for training delivery
3. Track training completion and effectiveness
4. Manage certifications and renewal alerts

1.4.6 Individual Development Plan (IDP)

1. Auto-generate IDPs based on gap analysis
2. Allow customization by managers
3. Track progress and completion status

1.5 Online / e-Learning Module

While physical classroom training is the primary delivery mode, the LMS shall provide a full-featured online learning capability for supplementary learning, pre-reading, refresher courses, and distance learning programmes.

1.5.1 Content Management and Authoring(Creation)

1. Integrated content authoring tool supporting: presentations (PPT, PDF upload), video lectures (upload/embed), audio modules, SCORM 1.2 / SCORM 2004 / xAPI (Tin Can) compliant packages.
2. Content versioning and draft/published/archived workflow.
3. Content tagging by topic, discipline, difficulty level, and target audience.
4. Bulk content upload with metadata import.
5. Secure storage with unique identity/hash for each uploaded resource (document, e-book, video, other materials) — preventing unauthorised duplication.
6. Lecture content creation, updating, and validation.
7. 2D,3D AR/VR content creation
8. Conversational (Podcast) creation centre
9. Video teaching material

1.5.2 Course Delivery

1. Self-paced online courses with configurable unlock conditions (sequential or free navigation).
2. Blended learning support — a combination of physical session attendance and online module completion tracked under the same course.
3. Progress tracking per learner per module (percentage complete, time spent, last accessed).
4. Mobile-responsive design; offline content download for areas with limited connectivity (mobile app or PWA).
5. Video streaming with playback controls; resume from last position.

1.5.3 E-Library (Digital Library)

1. Secure digital repository for e-books, technical manuals, research papers, standards, and reference documents.
2. Subscription-based access management — resources accessible only to authorised users as per subscription parameters.
3. Request and approval workflow for access to restricted digital resources; the librarian approves or rejects requests with notification.
4. Advanced search across title, author, subject, keyword, and ISBN/catalogue number.
5. Personalised e-library dashboard showing recent requests, frequently accessed resources, and new additions.
6. Catalogue management forms and bulk upload for digital resources.

1.6 Assessment, Examination, and Evaluation

1.6.1 Question Bank

1. Centralised question bank with questions categorised by subject, topic, type (MCQ, true/false, short answer, descriptive), and difficulty level.
 2. Bulk question import via Excel/Word template.
 3. Version control and question history.
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1.6.2 Online Quiz and Tests

1. Session-based quiz initialisation with question-set preparation, type configuration, and validation.
2. Linkage of quiz sessions with invited/enrolled trainees.
3. Quiz engine: server-maintained timer per user, question randomisation/jumbling, enforced submission on time-out.
4. User-wise question-paper generation (anti-copying through randomisation).
5. Auto-grading for objective questions; subjective questions routed to evaluator.
6. Result display to the trainee immediately after the objective test completion.
7. Quiz dashboard showing live participation status, submission status, and preliminary scores.

1.6.3 Scheduled Examinations

1. Examination scheduling linked to the batch timetable.
2. Online and offline (physical) examination support; marks entry interface for manual exams.
3. Re-examination and supplementary examination management.

1.6.4 Performance Analytics

1. Trainee-wise performance reports: module-wise, subject-wise, cumulative.
2. Batch-level performance analytics with bell-curve and percentile distribution.
3. Report card generation (downloadable PDF).
4. Comparative analytics across batches and years.
5. Report Generation in the prescribed format for compliance.

1.7 Feedback and Survey Management

1. Configurable feedback forms for: post-session feedback (faculty rated by trainees), end-of-course feedback, infrastructure feedback, and programme effectiveness surveys.
2. Auto-trigger of feedback form to trainees after each session/course completion.
3. Feedback anonymous option configurable per form.
4. Real-time aggregation and visualisation of feedback responses (star ratings, NPS, average scores).
5. Faculty performance report compiled from trainee feedback; visible only to Principal and above.
6. Smooth running of invitation and feedback modules (inherited from existing TIMS capability).
7. Export feedback reports to Excel/PDF.

1.8 Certification and Records Management

1. Automated certificate generation on successful course completion (configurable templates with NHSRCL letterhead, trainee details, course details, authorised signatory).
 2. Digital certificate with QR code for online verification.
 3. Transcript generation showing all completed courses, marks, and dates.
 4. Certificate reprint with audit trail.
 5. External verification portal — any stakeholder can verify certificate authenticity by entering the certificate number or scanning the QR code.
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6. Permanent archival of all certificates; accessible to trainees through the self-service portal.
 7. Alert employees and controlling officers in case of competency expiration.
 8. Alert employees of any scheduled training marked to him/her.

1.9 Library Management System (Physical Library)

1.9.1 Catalogue Management

1. Catalogue creation and management for books, journals, technical manuals, standards, periodicals, CDs/DVDs, and any other physical study materials.
2. Unique barcode generation and printing for each physical item (books, journals, and other materials).
3. Advanced search across catalogue fields: title, author, subject, publisher, accession number, and ISBN.
4. Kiosk-type public dashboard for anonymous search of available items without login.
5. Catalogue management upload forms for bulk entry.

1.9.2 Circulation Management

1. NHSRCL member management: register all members (trainees, faculty, staff) with a library card linked to their trainee/staff ID.
2. Issue and return transactions: scan barcode or enter accession number; due date auto-calculated per item-type policy.
3. Fine calculation for overdue items with notification generation (email/SMS).
4. Renewal facility (online self-service and at the counter).
5. Item reservation/hold request management.
6. Issue/return reports: daily, member-wise, item-wise, overdue list.

1.9.3 Inventory and Reports

1. Complete inventory management with stock verification (physical count vs. records).
2. New acquisition request and approval workflow.
3. Weeding/deaccession process with approval and record update.
4. Standard library reports: accession register, issue register, member-wise history, fine collected, stock verification report.

1.10 Hostel and Accommodation Management

HSTRI provides hostel accommodation for outstation trainees and visiting faculty. The system shall comprehensively manage this facility.

1.10.1 Room and Facility Master

1. floor/block/room master data: room number, type (single, double, differently abled), category (trainee, faculty, guest), capacity, amenities.
 2. Real-time room availability dashboard (vacant, occupied, under maintenance).
 3. Hostel policy configuration: check-in time, check-out time, and advance booking window.
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1.10.2 Allocation and Booking

1. Automatic room allocation at trainee batch induction based on accommodation eligibility rules; manual override by warden.
2. Online advance room booking portal for faculty and guest lecturers.
3. Check-in / check-out registration with date-time stamp; ID verification log.
4. Early departure and extension of stay management with notification to administration.
5. Waiting list management when rooms are at full capacity.

1.10.3 Housekeeping and Maintenance

1. Periodic housekeeping inspection schedule and checklist (room-wise).
2. Defect/complaint logging by occupant via portal; assignment to maintenance staff; status tracking and closure.
3. Preventive maintenance schedule for hostel facilities.

1.10.4 Billing and Reports

1. Integration with accounts/finance module for payment recording and reconciliation.
2. Hostel occupancy reports: daily, monthly, batch-wise, year-wise.
3. Revenue reports, pending dues, and collection reports.

1.11 Inventory and Asset Management

1. Master catalogue of all training materials, equipment, consumables, and fixed assets.
2. Stock receipt, issue, and return transactions linked to sessions/batches.
3. Low-stock alert configuration with notification to stores in charge.
4. Asset tagging and lifecycle tracking (purchase, deployment, maintenance, disposal).
5. Periodic checkup schedule for the smooth running of the inventory module.
6. Minor change request workflow (user-raised change request reviewed by stores).
7. Inventory reports: stock register, consumption report, indent register, disposal register.

1.12 Notification and Communication

1. Automated email and SMS notifications for: batch commencement, timetable updates, attendance shortfall, assessment results, library dues, hostel billing, certificate readiness.
2. In-application notification bell with read/unread status.
3. Bulk announcement/circular module: The principal can broadcast notices to all trainees, faculty, or specific batches.
4. Notice board module: institute notices displayed on trainee/faculty dashboards.
5. SMS/email template management by administrator.
6. Notification log with delivery status tracking.

1.13 Reports and Analytics

1.13.1 Dashboards

1. Role-based dashboards: Principal dashboard (KPIs: active batches, trainees, occupancy, assessment scores, feedback averages); Trainee dashboard (my courses, attendance, results, library, hostel); Faculty dashboard (my sessions, pending attendance, feedback scores).
2. Real-time operational dashboard: live session status, ongoing assessments, hostel occupancy.

1.13.2 Standard Reports

The system shall generate at a minimum the following reports, exportable as PDF and Excel:

S.No	Report	Module
1	Batch-wise Trainee List	Trainee Management
2	Daily / Monthly Attendance Register	Physical Class Management
3	Faculty Workload Report	Physical Class Management
4	Timetable Summary	Physical Class Management
5	Course-wise Assessment Score Report	Assessment
6	Batch Performance Report	Assessment
7	Certificate Issuance Register	Certification
8	Library Accession Register	Library Management
9	Overdue Items and Fine Report	Library Management
10	Digital Resource Access Log	E-Library
11	Hostel Occupancy Report	Hostel Management
12	Hostel Billing and Revenue Report	Hostel Management
13	Inventory Stock Register	Inventory Management
14	Feedback Analysis Report	Feedback
15	Training MIS (Monthly/Annual)	All Modules
16	Competency Mapping	Skill Assessment and Gap Analysis
17	Competency Lifecycle	Alert employees and controlling officers in case of competency expiration
