

Informatics and computer science, Winter 2025
Project Description
“Comprehensive Human Resource Management System (HRMS)”

1 Project Overview

In this project, you will design and implement a database schema for a comprehensive Human Resource Management System (HRMS). The objective is to create a centralized and intelligent platform that automates and streamlines core human resource functions across the organization. The system focuses on managing key operations such as employee profiling, attendance tracking, payroll computation, leave administration, shift scheduling, and contract management.

The platform’s core purpose is to ensure consistency, transparency, and operational efficiency in HR processes by integrating all employee-related data within a unified structure. Through well-defined entities and relationships, the database supports distinct user roles—including employees, line managers, HR administrators, payroll specialists, and system administrators—each with clearly defined scopes of access and control.

By aligning data management with organizational rules and workflow automation, the HRMS serves as the foundation for accurate record-keeping, policy enforcement, and decision-making analytics, promoting accountability and reliability across all human resource activities.

2 Systems Requirements

The HRMS database consists of several core entities, each representing a key aspect of the organization’s HR operations. The following sections describe these entities in detail, outlining their purpose and primary descriptive features.

2.1 Employee

Employee represents each individual working within the organization. Every employee is uniquely identified by an ID and described by personal and professional features such as full name, national identification, insurance information, date of birth, and country of birth. Contact details include features for email, phone, and emergency contact. Additional features capture personal details such as biography and profile image, while employment progress and account status are reflected through features related to hiring date, employment state, activation, and completeness. Each employee has details such as their department, position, direct manager, employment contract, applicable tax information, and the salary type.

Subcategories of employees represent specialized organizational roles, each extending the base employee entity with additional responsibilities and control features:

- **HR Administrator** – includes features defining approval authority like the approval level (e.g., “Department-Level”, “Organization-Wide”), record access scope (e.g., “Employee Profiles”, “Payroll Records”, “Leave Requests”), and document validation rights (e.g., “Approve Contracts”, “Verify Certifications”, “Validate Attendance Adjustments”), ensuring they can manage and validate HR-related documents.

- **System Administrator** – includes features for access control and configuration parameters, such as system privilege level (e.g., “Super Admin”, “Module Admin”), configurable fields list (e.g., “Mandatory Fields for Employee Registration”, “Payroll Parameters”, “Shift Schedules”), and audit visibility scope (e.g., “Full System Logs”, “Payroll Audit Only”, “User Activity Logs”), allowing them to govern mandatory fields and overall system structure.
- **Payroll Specialist** – includes features describing payroll management region and the most recent payroll processing date, like assigned region (e.g., “North Region”, “Head Office”), processing frequency (e.g., “Monthly”, “Bi-Weekly”, “On-Demand”), and last processed period (e.g., “August 2025”), ensuring oversight of compensation accuracy.
- **Line Manager** – includes features specifying team size and the departments under supervision, and approval limit (e.g., “Up to Department Level”), representing managerial scope and leadership responsibilities.

These subcategories maintain shared employee identity while reflecting distinct roles and privileges within the system.

2.2 Role

Role defines access levels and permissions assigned to different categories of users. Each role is uniquely identified by an ID and described by features defining its name and purpose. Employees can be linked with more than one role, allowing them to perform various system functions according to their assigned responsibilities.

2.3 Department

Department organizes the company’s workforce into distinct functional areas. Each department is uniquely identified by an ID and described by features that define its name and purpose. Employees are grouped under departments, allowing structured reporting and management alignment.

2.4 Position

Position captures the official job titles or designations within the company. Each position is uniquely identified by an ID and described by features defining its title and responsibilities. Employees are aligned with specific positions, helping define their scope of duties and placement in the organizational hierarchy.

2.5 Contract

Contract defines the employment terms between the organization and an employee. Each contract is uniquely identified by an ID and includes features describing its type (permanent, temporary, consultant, or internship), start and end dates, and current state (e.g., Active, Expired, Under Renewal). Specialized contract subtypes further define employment terms:

- **Full-Time Contract** – includes features for leave entitlement (e.g., “30 Days Annually”), insurance eligibility (e.g., “Comprehensive Health and Life Coverage”), and weekly working hours.
- **Part-Time Contract** – specifies features for hourly rate and monthly working limits (e.g., “80 Hours per Month”).
- **Consultant Contract** – defines features for project scope (e.g., “System Integration and Data Migration”), fees (e.g., “\$ 5,000 per Project”), and payment schedules (e.g., “Milestone-Based”, “50% on Start, 50% on Completion”).
- **Internship Contract** – records mentoring (e.g., “Assigned to Senior Developer”), evaluation (e.g., “Performance Review at End of Term”), and stipend-related features (e.g., “\$600 Monthly”).

2.6 Skill

Skill records specific abilities or competencies employees possess. Each skill is uniquely identified by an ID and described by features representing its name and description. An employee can be associated with multiple skills, and each skill can relate to several employees, allowing flexible mapping of capabilities across the workforce.

2.7 Verification

Verification keeps track of certifications and credentials employees have earned. Each record includes features defining its type, issuer, issue date, and expiry period and a uniquely identifying ID. More than one verification entry can be connected to the employee who holds it, documenting professional qualifications and their validity.

2.8 Attendance

Attendance captures records of employee presence and working hours. Each record is uniquely identified and linked to an employee and their shift schedule. Features for entry time, exit time, and duration track daily activity, while status indicates whether employee was present, absent, or late. Additional features specify the building log in and log out method (e.g., “ID card”, “Fingerprint”). Each employee can have multiple attendance records reflecting their daily participation over time.

2.9 Shift Schedule

ShiftSchedule outlines structured working hours within the organization. It’s uniquely identified by an ID and defined by features describing its name, type, start and end times, break periods, and date. A status feature indicates whether the shift is active. Employees may be linked to various shifts based on departmental scheduling needs.

2.10 Leave

Leave classifies the various categories of leave available to employees. Each type is defined by a unique ID, type and description. Subcategories of leave handle specific rules and documentation requirements:

- **Vacation Leave** – includes features related to carry-over eligibility (e.g., “Up to 5 Days per Year Can Be Carried Over”) and approving manager (e.g., “Direct Line Manager” or “Department Head”).
- **Sick Leave** – includes features for medical certification (e.g., “Required for Absences Exceeding 2 Days”) and physician identification (Medical Practitioner ID).
- **Probation Leave** – records eligibility start date (e.g., “1/1/2027”) and probation period features (e.g., “90 days”).
- **Holiday Leave** – includes holiday name, official recognition, and regional scope.

Leave types are associated with requests made by employees, supporting automated policy enforcement and entitlement calculation.

2.11 Leave Request

LeaveRequest manages employee applications for leave. Each request is uniquely identified and linked to both the employee and the type of leave being requested. Features define request duration, justification, current status, and approval timing. Each employee may have multiple requests over time, all tied to corresponding leave types.

2.12 Leave Policy

LeavePolicy establishes organizational rules governing leave entitlements. Each policy is uniquely identified by an ID and described by features outlining its name, purpose, eligibility rules, and required notice period. Policies are associated with specific leave categories, ensuring consistent application of rules and entitlements across all employees.

2.13 Payroll

Payroll manages the calculation and documentation of employee compensation. Each record is uniquely identified by an ID and linked to an employee. Payroll periods are defined by time range features, and financial features capture all elements affecting payment — including base amount, actual pay, adjustments, taxes, contributions, and net salary — ensuring accurate computation. Each employee can have multiple payroll records reflecting their periodic earnings.

2.14 Allowance and Deduction

AllowanceDeduction provides a detailed breakdown of supplementary financial adjustments applied to an employee's payroll. It is defined in the context of both the payroll period and the employee to whom it applies, ensuring that each entry represents a specific adjustment within a particular payment cycle. Each record is described by features indicating its type (e.g., Bonus, Transport Allowance, Insurance Deduction), monetary amount, currency, duration, and applicable time zone. This ensures precise tracking of financial adjustments and supports accuracy in overall payroll processing.

2.15 Salary Type

SalaryType defines how an employee's compensation is structured. Each salary type is uniquely identified by an ID and described by features indicating its type, payment frequency (e.g., "Monthly", "Hourly", "Per Contract"), and applicable currency (e.g., "USD", "EUR").

- **Hourly Salary Type** – includes features for hourly rate (e.g., "\$20 per Hour") and maximum working hours (e.g., "160 Hours per Month"), allowing precise calculation of pay based on recorded attendance.
- **Monthly Salary Type** – specifies features for taxation rules (e.g., "Standard Income Tax – 10%") and contribution schemes (e.g., "Pension and Health Insurance Contributions"), supporting automatic deductions and compliance with regulatory requirements.
- **Contract-Based Salary Type** – includes features for contract value (e.g., "\$12,000 for 6-Month Project") and installment details (e.g., "Disbursed in Three Equal Payments"), defining structured disbursements over the contract duration.

Each employee has one defined salary structure, ensuring that their compensation framework aligns consistently with employment terms and contract conditions.

2.16 Payroll Policy

PayrollPolicy defines the organization's financial adjustment rules. Each policy is uniquely identified by an ID and described by features specifying its type (e.g., Overtime, Bonus, Deduction), effective date (e.g., "Effective from 01-Feb-2025"), and purpose or description (e.g., "Regulates employee compensation beyond standard working hours"). Subcategories introduce specialized rules applied during payroll computation:

- **Overtime Policy** – defines rate multipliers (e.g., "1.5× for Weekdays", "2× for Weekends") and hour limits (e.g., "Maximum 20 Hours per Month") to ensure consistent pay for additional work.

- **Lateness Policy** – specifies grace periods (e.g., “10 Minutes per Day”) and deduction rates (e.g., “\$5 per 15-Minute Delay”), supporting punctuality enforcement.
- **Bonus Policy** – outlines bonus types (e.g., “Performance-Based”, “Festive Bonus”) and eligibility criteria (e.g., “Minimum 6 Months of Service and Above 90% Attendance”).
- **Deduction Policy** – describes deduction reasons (e.g., “Unpaid Leave”, “Policy Violation”) and calculation modes (e.g., “Percentage-Based: 5% of Basic Salary” or “Flat Amount: \$50 per Occurrence”).

Each payroll run may apply several policies, while a single policy can guide multiple payroll computations. Payroll policies serve as reference conditions within payroll processing, enabling automated inclusion or exclusion of allowances, bonuses, and deductions. This ensures consistent application of compensation rules and reduces manual computation errors.

2.17 Insurance

Insurance holds information about coverage and contribution details. It is uniquely identified by an ID and includes features describing insurance type (e.g., “Health Insurance”, “Life Insurance”, “Accident Coverage”), related contract category, contribution rate, and coverage description. Contracts reference applicable insurance schemes to define benefit eligibility and contribution terms.

Insurance schemes are referenced by employment contracts to specify applicable benefits and contribution terms. Multiple contracts may refer to the same insurance plan, ensuring consistent benefit structures across eligible employees.

2.18 Tax Form

TaxForm specifies tax-related information required for compliance. Each form is uniquely identified by an ID and described by features such as jurisdiction (e.g., “Federal”, “State of California”, “European Union”), form content (e.g., “Income declaration and withholding rules based on regional tax laws”), and validity period (e.g., “01-Jan-2025 to 31-Dec-2025”), indicating the time frame during which the form version is applicable.

The form content represents the tax rules and regulations enforced within the jurisdiction, outlining details such as income brackets, deduction limits, and contribution obligations. Multiple employees may refer to the same valid tax form within its active period, ensuring consistent and lawful tax computation across the workforce.

2.19 Notification

Notification delivers system-generated alerts and updates to employees. Each notification includes features identifying the message content, timestamp, urgency, and read status. Each notification is directed to the employees it concerns, supporting timely communication within the HR system.

2.20 Mission

Mission records business trips or off-site assignments. Each mission has a unique ID and includes features describing the destination, period, status, the employee assigned and the manager assigning the mission. An employee may participate in multiple missions across their employment period.

2.21 Exception

Exception captures non-working days or special holidays. It’s identified by features including its unique ID, name, category, date, and current status, it enables the HRMS to recognize days exempted from

regular attendance tracking. Exception records are applied within the attendance process, ensuring that work hours and payroll calculations properly account for holidays and other special days.

2.22 Reimbursement

Reimbursement handles employee claims for official expenses. Each record includes an ID the claim type, value, submission and approval dates, and current status. Each reimbursement is associated with the employee who submitted it, allowing multiple claims to be tracked per individual and ensuring transparency in financial approvals.

2.23 Termination

Termination represents the conclusion of an employment relationship. Each record is uniquely identified by an ID and includes features referencing the contract being closed, along with details such as termination date and reason. Through its association with the contract, the termination record reflects the corresponding employee, ensuring accurate exit documentation and payroll closure.

2.24 Payroll Log

PayrollLog captures modifications related to payroll processing activities. Each record is defined in the context of a specific payroll entry and includes features describing the actor who performed the change, the change date, and the modification type (e.g., “Salary Adjustment”, “Bonus Added”, “Deduction Removed”).

Each log is recorded within the scope of a specific payroll entry, providing a detailed audit trail of how compensation data has evolved over time. This ensures accountability in financial operations and supports transparent payroll management.

2.25 Attendance Log

AttendanceLog records updates or corrections applied to attendance data. Each record is defined in the context of a specific attendance entry and includes features describing the user who performed the change, the change timestamp, and the modification reason (e.g., “Check-in Time Updated”, “Absence Justified”, “Shift Reassigned”).

Each log is maintained within the scope of its related attendance entry, documenting every adjustment made to attendance tracking. This ensures all modifications remain visible, verified, and historically traceable within the system.