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Mid-Sized Employer Management System

URL: http://classwork.engr.oregonstate.edu:43818/

Executive Summary:
Developed an HR management database for a mid-sized company (200+ employees) to streamline employee data, payroll, benefits, and time-off tracking.

Key Changes & Feedback Implementation

1. Design Phase (Steps 1–2)
    ○ Initial Shortfalls: Inconsistent naming (singular/plural entities), incomplete ERD details, hardcoded foreign keys.
    ○ Critical Fixes:
        ■ Standardized pluralized entities (e.g., Employees).
        ■ Simplified ERD to high-level relationships.
        ■ Removed redundant attributes (e.g., manager_id) and hardcoded data.
    ○ Outcome: Cohesive schema adhering to 2NF, with clear PKs/FKs and optimized SQL structure.
2. UI/UX Phase (Step 3)
    ○ Critical Gaps: Missing CRUD operations for entities/M:M relationships; clunky navigation; unformatted data.
    ○ Key Enhancements:
        ■ Added DELETE/UPDATE forms for all entities and M:M relationships
        ■ Created dedicated Employee_Benefits page for M:M management.
        ■ Implemented menu-based navigation and simplified date formats.
    ○ Outcome: Intuitive UI supporting full data lifecycle management.
3. Finalization (Step 4)
    ○ Documentation Gaps: Lack of README, inadequate source citations.
    ○ Enhancements:
        ■ Added README with project scope, citations, and setup instructions.
        ■ Developed stored procedures for automated M:M updates/deletes.
    ○ Outcome: Fully documented, maintainable system with audit trails.

AI Tools: Strengths & Weaknesses

● Peer Feedback:
    ○ *Strength*: AI-assisted formatting (e.g., headers) improved readability.
    ○ *Weakness*: AI-generated feedback sometimes lacked depth (i.e. generic suggestions), requiring human validation.
● Our Usage:
    ○ *Strength*: Accelerated boilerplate code generation (i.e. form templates) and brainstorming for edge cases.
    ○ *Weakness*: AI-produced SQL/HTML often required significant contextual adjustments, risking logic errors if uncritically adopted.

Project Overview:

A mid-sized company has more than 200 employees across five departments. Over the years, managing employee information, departmental structures, payroll records, and benefits enrollment has become increasingly difficult. This Employee Management System will store and manage data for core entities including:

- **Employees**: personal info, job titles, department assignments

- **Departments**: leadership and budget information

- **Time-Off**: PTO balances, requests, approvals

- **Payroll**: pay schedules, deductions, and payment history

- **Benefits**: enrollments in health, dental, and retirement plans

The system will help HR and management efficiently monitor employee data within minutes, manage departmental hierarchies, approve and track time-off requests, process payrolls accurately, and track benefits enrollments. This will include the tracking of over 1,000 time-off requests/approvals, a handful of benefits information for all 200+ employees, up to 20,000 payroll transactions before a backup is required, and employee personal info for 5,000 people (if needed).
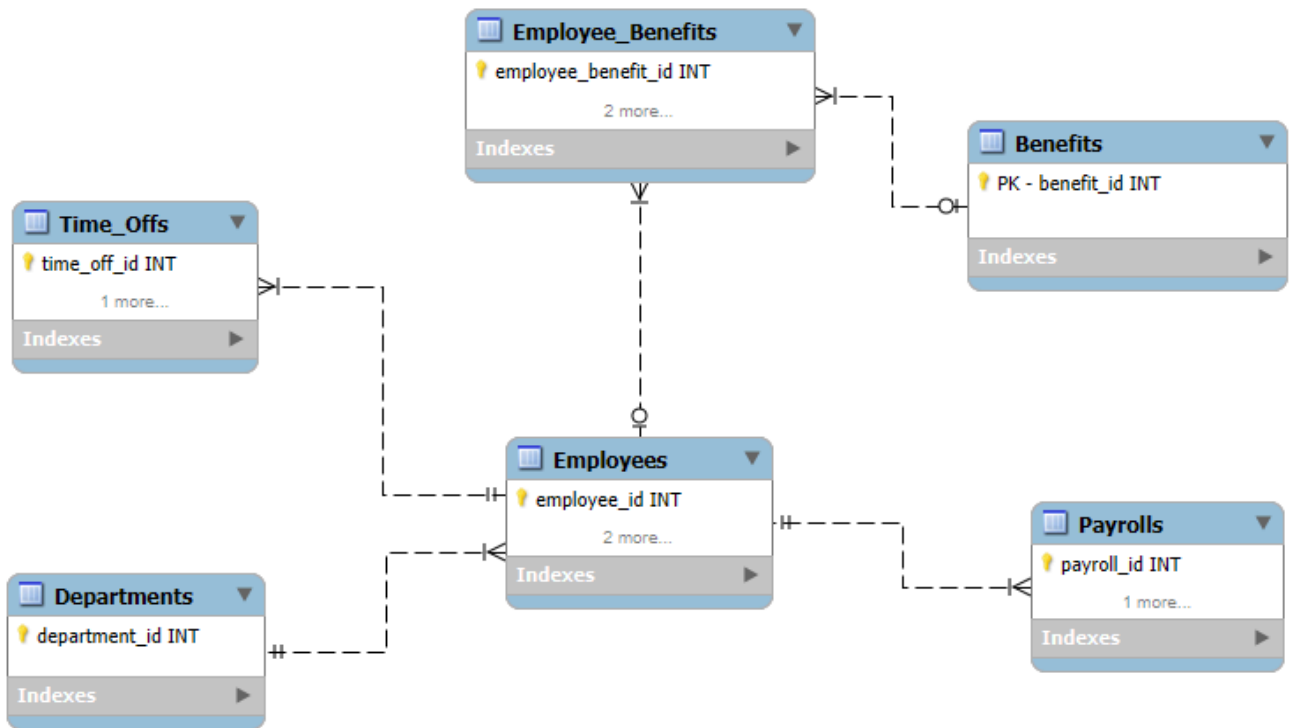
Database Outline:

- **Employees:** records the information of employees working for the company
    - employee_id: int, auto_increment, unique, not NULL, PK
    - first_name: varchar, not NULL
    - last_name: varchar, not NULL
    - email: varchar, unique, not NULL
    - phone: varchar, not NULL
    - birth_date: date, not NULL
    - hire_date: date, not NULL
    - job_title: varchar, not NULL
    - salary: int, not NULL
    - status: varchar, not NULL
    - department_id: FK referencing **Departments**

    - Relationship #1: a M:1 relationship between **Employees** and **Departments** is implemented with **department_id** as a FK inside of **Employees**.
    - Relationship #2: a 1:M relationship between **Employees** and **Time_Offs** is implemented with **employee_id** as a FK inside of **Time_Offs**.
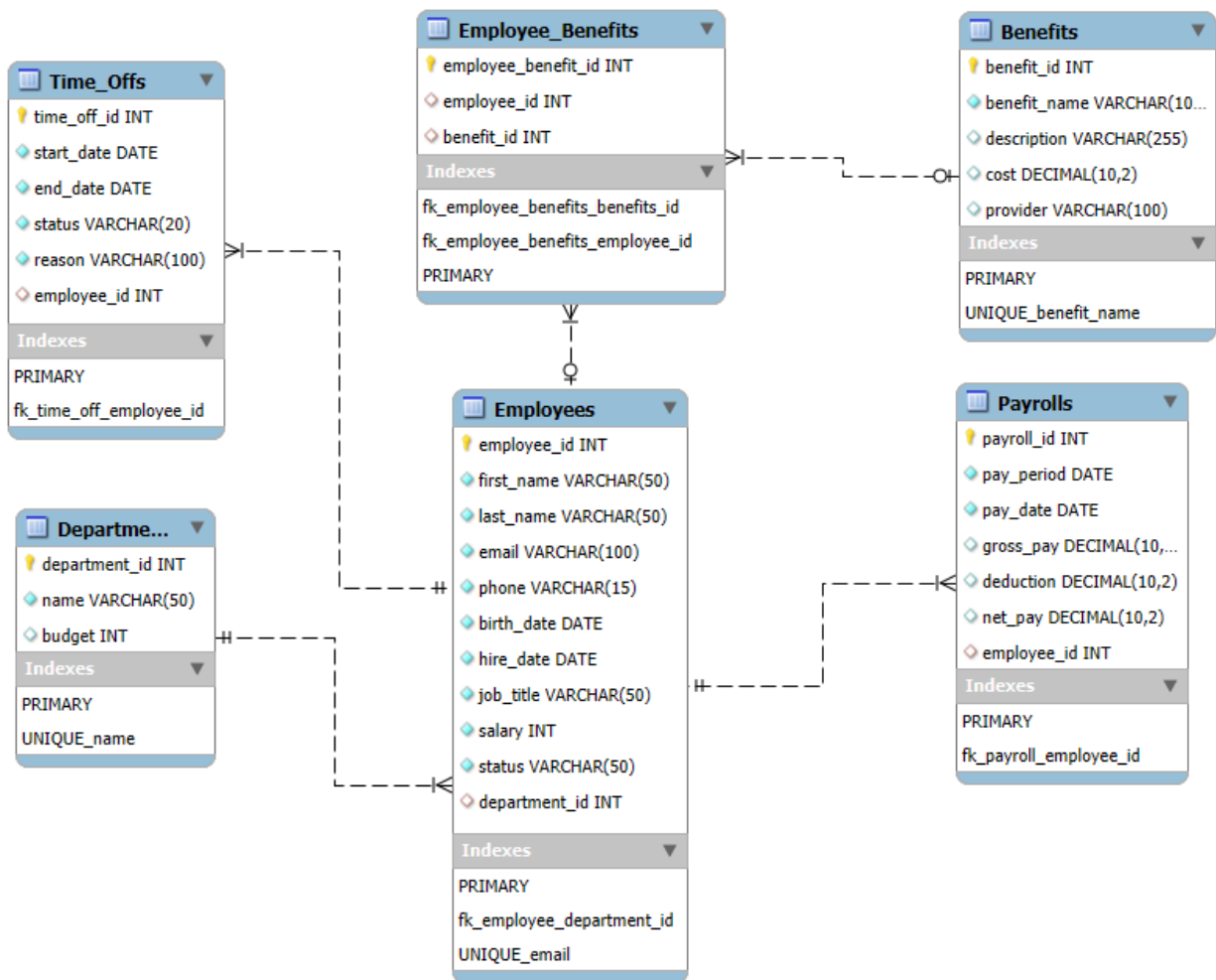
- ○ Relationship #3: a 1:M relationship between **Employees** and **Payrolls** is implemented with **employee_id** as a FK inside of **Payrolls**.
- ○ Relationship #4: a M:N relationship between **Employees** and **Benefits** is implemented with an intersection table (**Employee_Benefits)** that includes **employee_id** and **benefit_id** as FK's.

- **Departments:** records the names and heads of different departments
  - ○ department_id: int, auto_increment, unique, not NULL, PK
  - ○ name: varchar, not NULL, unique
  - ○ budget: int

  - ○ Relationship #1: a 1:M relationship between **Departments** and **Employees** is implemented with **department_id** as a FK inside of **Employees**.

- **Time_Offs:** records scheduled duration and reason of time-off for employees
  - ○ time_off_id: int, auto_increment, unique, not NULL, PK
  - ○ start_date: date, not NULL
  - ○ end_date: date, not NULL
  - ○ status: varchar, not NULL, constrained only to accept 'Pending', 'Approved', 'Denied'
  - ○ reason: varchar, not NULL
  - ○ employee_id: FK referencing **Employees**

  - ○ Relationship: a M:1 relationship between **Time_Offs** and **Employee** is implemented with **employee_id** as a FK inside of **Time_Offs**.
- **Payrolls:** records the pay information for each employee (i.e. pay period, amount, deductions, etc.)
  - ○ payroll_id: int, auto_increment, unique, not NULL, PK
  - ○ pay_period: date, not NULL
  - ○ pay_date: date, not NULL, (date payment issued)
  - ○ gross_pay: decimal(10, 2), (total before deduction)
  - ○ deduction: decimal(10, 2), (taxes, insurance, retirement)
  - ○ net_pay: decimal(10, 2), (gross - deductions)
  - ○ employee_id: FK referencing Employees

- ○ Relationship: a M:1 relationship between **Payrolls** and **Employees** is implemented with **employee_id** as a FK inside of **Payrolls**.

- ● **Benefits:** records benefits and description of it
  - ○ benefit_id: int, auto_increment, unique, not NULL, PK
  - ○ benefit_name: varchar, not NULL
  - ○ description: varchar
  - ○ cost: decimal(10, 2)
  - ○ provider: varchar, (Blue Cross, Fidelity, etc.)

  - ○ Relationship: a M:N relationship between **Benefits** and **Employees** is implemented with an intersection table (**Employee_benefits)** that includes **employee_id** and **benefit_id** as FK's.

- ● **Employee_Benefits:** intersection table for an M:N relationship
  - ○ employee_benefits_id: int, auto_increment, unique, not NULL, PK
  - ○ employee_id: int, FK referencing **Employees**
  - ○ benefit_id: int, FK referencing **Benefits**

  - ○ Relationship: serves as the intersection table connecting the M:N relationship between **Employees** and **Benefits.**

ER Diagram:

Employee_Benefits
- employee_benefit_id INT
- 2 more...
- Indexes

Benefits
- PK - benefit_id INT
- Indexes

Time_Offs
- time_off_id INT
- 1 more...
- Indexes

Employees
- employee_id INT
- 2 more...
- Indexes

Departments
- department_id INT
- Indexes

Payrolls
- payroll_id INT
- 1 more...
- Indexes

Schema:

Time_Offs
- time_off_id INT
- start_date DATE
- end_date DATE
- status VARCHAR(20)
- reason VARCHAR(100)
- employee_id INT

Indexes
- PRIMARY
- fk_time_off_employee_id

Employee_Benefits
- employee_benefit_id INT
- employee_id INT
- benefit_id INT

Indexes
- fk_employee_benefits_benefits_id
- fk_employee_benefits_employee_id
- PRIMARY

Benefits
- benefit_id INT
- benefit_name VARCHAR(10...
- description VARCHAR(255)
- cost DECIMAL(10,2)
- provider VARCHAR(100)

Indexes
- PRIMARY
- UNIQUE_benefit_name

Departme...
- department_id INT
- name VARCHAR(50)
- budget INT

Indexes
- PRIMARY
- UNIQUE_name

Employees
- employee_id INT
- first_name VARCHAR(50)
- last_name VARCHAR(50)
- email VARCHAR(100)
- phone VARCHAR(15)
- birth_date DATE
- hire_date DATE
- job_title VARCHAR(50)
- salary INT
- status VARCHAR(50)
- department_id INT

Indexes
- PRIMARY
- fk_employee_department_id
- UNIQUE_email

Payrolls
- payroll_id INT
- pay_period DATE
- pay_date DATE
- gross_pay DECIMAL(10,...
- deduction DECIMAL(10,2)
- net_pay DECIMAL(10,2)
- employee_id INT

Indexes
- PRIMARY
- fk_payroll_employee_id

Example Data:

Departments (department_id, name, manager_name, budget):

('Human Resources', 'Alice Johnson', 500000),

('Engineering', 'Bob Smith', 2000000),

('Sales', 'Betty White', 1000000)

Benefits (benefit_id, benefit_name, description, cost, provider):

('Health Insurance', 'Covers medical expenses', 250.00, 'Blue Cross'),

('Dental Plan', 'Covers dental expenses', 75.00, 'Delta Dental'),

('Retirement 401k', 'Company retirement plan', 0.00, 'Fidelity')

Employees (employee_id, first_name, last_name, email, phone, birth_date, hire_date, job_title, salary, status, department_id):

('John', 'Doe', 'john.doe@company.com', '123-456-7890', '1985-04-12', '2010-06-01', 'Software Engineer', 95000, 'Active', 2),

('Jane', 'Smith', 'jane.smith@company.com', '234-567-8901', '1990-08-20', '2015-09-15', 'HR Manager', 85000, 'Active', 1),

('Mike', 'Jones', 'mike.jones@company.com', '345-678-9012', '1975-02-28', '2005-01-10', 'Sales Lead', 80000, 'Active', 3)

Time_Offs (time_off_id, start_date, end_date, status, reason, employee_id):

('2025-06-01', '2025-06-10', 'Approved', 'Vacation', 1),

('2025-07-15', '2025-07-20', 'Pending', 'Medical', 2),

('2025-08-05', '2025-08-06', 'Denied', 'Personal Errands', 3)

Payrolls (payroll_id, pay_period, pay_date, gross_pay, deduction, net_pay, employee_id):

('2025-05-01', '2025-05-15', 5000.00, 1000.00, 4000.00, 1),

('2025-05-01', '2025-05-15', 4200.00, 800.00, 3400.00, 2),

('2025-05-01', '2025-05-15', 4000.00, 700.00, 3300.00, 3)

Employee_Benefits (employee_benefit_id, employee_id, benefit_id):

(1, 1, 1), (2, 1, 3), (3, 2, 1), (4, 2, 2), (5, 3, 1)

UI Screenshots:

Home (RESET is available on every page)

Home	Employees	Departments	Benefits	Payrolls	Time-Offs	Employee Benefits	RESET

Employee Management System

This is a database system that is to be utilized by small to mid-sized business to track employee data, time-off, benefits, and payroll.
Developed by: Matthew Kerr and Shawn McManus

CREATE/READ/UPDATE/DELETE Employees page

Employees

ID	First Name	Last Name	Email	Phone	Birth Date	Hire Date	Job Title	Salary	Status	Department ID	Actions
1	John	Doe	john.doe@company.com	123-456-7890	April 12, 1985	June 1, 2010	Software Engineer	95000	Active	2	Update Delete
2	Jane	Smith	jane.smith@company.com	234-567-8901	August 20, 1990	September 15, 2015	HR Manager	85000	Active	1	Update Delete
3	Mike	Jones	mike.jones@company.com	345-678-9012	February 28, 1975	January 10, 2005	Sales Lead	80000	Active	3	Update Delete
4	Betty	White	betty.white@company.com	777-555-1234	May 18, 1945	March 12, 2020	Sales Manager	100000	Active	3	Update Delete
5	Alice	Johnson	alice.johnson@company.com	201-867-5309	February 26, 1985	October 2, 2018	Head of HR	120000	Active	1	Update Delete
6	Bob	Smith	bob.smith@company.com	569-368-6842	September 3, 1967	December 1, 2022	Software Engineer Lead	150000	Active	2	Update Delete

Add New Employee

First Name:

Last Name:

Email:

Phone:

CREATE/READ/UPDATE/DELETE Departments page

Departments

Name	Budget	Employees	Actions
Human Resources	$500000	Jane Smith Alice Johnson	Update Delete
Engineering	$2000000	John Doe Bob Smith	Update Delete
Sales	$1000000	Mike Jones Betty White	Update Delete

Add New Department

Name:

Budget:

Add Department

CREATE/READ/UPDATE/DELETE Benefits page

Benefits

Name	Description	Cost	Provider	Actions
Health Insurance	Covers medical expenses	250.00	Blue Cross	Update Delete
Dental Plan	Covers dental expenses	75.00	Delta Dental	Update Delete
Retirement 401k	Company retirement plan	0.00	Fidelity	Update Delete

Add a New Benefit

Name:

Description:

Cost:

Provider:

Add Benefit

CREATE/READ/UPDATE/DELETE Payrolls page

Payrolls

Employee	Pay Period	Pay Date	Gross Pay	Deduction	Net Pay	Actions
John Doe	May 1, 2025	May 15, 2025	5000.00	1000.00	4000.00	Update Delete
Jane Smith	May 1, 2025	May 15, 2025	4200.00	800.00	3400.00	Update Delete
Mike Jones	May 1, 2025	May 15, 2025	4000.00	700.00	3300.00	Update Delete

Add New Payroll

Employee:

John Doe

Pay Period:

mm/dd/yyyy

Pay Date:

mm/dd/yyyy

Gross Pay:

Deduction:

Net Pay:

Add Payroll

CREATE/READ/UPDATE/DELETE Time-Offs page

Time-Off Requests

Employee	Start Date	End Date	Status	Reason	Actions
John Doe	June 1, 2025	June 10, 2025	Approved	Vacation	Update Delete
Jane Smith	July 15, 2025	July 20, 2025	Pending	Medical	Update Delete
Mike Jones	August 5, 2025	August 6, 2025	Denied	Personal Errands	Update Delete

Input Employee Time-Off Request

Employee:
John Doe

Start Date:
mm/dd/yyyy

End Date:
mm/dd/yyyy

Status:
Pending

Reason:

Submit Request

CREATE/READ/UPDATE/DELETE Employee Benefits page (M:N entity)

Employee Benefits

ID	Full Name	Benefits
1	John Doe	Health Insurance - Covers medical expenses Update Delete Retirement 401k - Company retirement plan Update Delete
2	Jane Smith	Health Insurance - Covers medical expenses Update Delete Dental Plan - Covers dental expenses Update Delete
3	Mike Jones	Health Insurance - Covers medical expenses Update Delete
4	Betty White	No benefits
5	Alice Johnson	No benefits
6	Bob Smith	No benefits

Assign a Benefit to an Employee

Employee:
John Doe

Benefit:
Dental Plan

Add Benefit

Sources:
- Activity 2 from Week 1 module url: (https://canvas.oregonstate.edu/courses/1999601/assignments/10006370)
- ChatGPT (specific instances when used are listed in code)
- GeeksforGeeks.org (used for general SQL commands and operations)