

erp-iiitd

An ERP that was made as a project in Advanced Programming Course (CSE201) at IIITD

Team

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Prerequisites

- You should have docker and java installed on your system.

Running Steps

```
docker compose up -d  
mvn clean package  
java -jar target/university-erp-1.0-jar-with-dependencies.jar
```

File Structure

```
 .  
 └── docker-compose.yml  
 └── docker-init  
     ├── auth_schema.sql  
     ├── erp_schema.sql  
     └── seed_data.sql  
 └── logs  
     └── erp.log  
 └── objectives.pdf  
 └── pom.xml  
 └── README.md  
 └── src  
     └── main  
         └── java  
             └── edu  
                 └── univ  
                     └── erp
```

```
    └── auth
        ├── AuthService.java
        ├── PasswordUtil.java
        └── SessionManager.java
    └── data
        ├── AuthDao.java
        ├── BaseDao.java
        ├── CourseDao.java
        ├── DBPool.java
        ├── EnrollmentDao.java
        ├── GradeDao.java
        ├── InstructorDao.java
        ├── NotificationDao.java
        ├── SectionDao.java
        ├── SettingsDao.java
        └── StudentDao.java
    └── domain
        ├── Admin.java
        ├── Course.java
        ├── Enrollment.java
        └── grades
            ├── AssignmentComponent.java
            ├── EndsemComponent.java
            ├── Gradebook.java
            ├── GradeComponent.java
            ├── GradeType.java
            ├── MidsemComponent.java
            ├── ProjectComponent.java
            └── QuizComponent.java
        ├── Instructor.java
        ├── Notification.java
        ├── NotificationTarget.java
        ├── Role.java
        ├── Section.java
        ├── Student.java
        ├── TranscriptRow.java
        └── User.java
    └── exception
        ├── AccessDeniedException.java
        ├── AuthException.java
        ├── DatabaseException.java
        ├── ERPException.java
        ├── NotFoundException.java
        └── ValidationException.java
```

```
    └── service
        ├── AccessControl.java
        ├── AdminService.java
        ├── InstructorService.java
        ├── NotificationListener.java
        ├── NotificationService.java
        └── StudentService.java
    └── ui
        └── admin
            ├── AddCourseDialog.java
            ├── AddSectionDialog.java
            ├── AddUserDialog.java
            ├── AdminPanel.java
            └── AssignInstructorDialog.java
        └── components
            ├── DeadlineRefresher.java
            ├── MaintenanceBanner.java
            ├── MaintenanceRefresher.java
            ├── NotificationBanner.java
            └── ToastBanner.java
        └── grades
            └── GradeTableFrame.java
        └── InstructorPanel.java
        └── LoginFrame.java
        └── Main.java
        └── NotificationDialog.java
        └── StudentPanel.java
        └── timetable
            ├── TimeSlotParser.java
            ├── TimetableFrame.java
            └── TimetableModel.java
        └── UIError.java
        └── UIStyle.java
    └── util
        ├── AutoTableResize.java
        └── export
            └── CSVExporter.java
└── resources
    ├── application.properties
    ├── fonts
    │   └── Cantarell-Regular.ttf
    └── logback.xml
```

```
25 directories, 85 files
```

Directly interacting with the database

```
docker exec -it erp-mariadb mysql -u root -p
```

1. Introduction

This project implements a functional University ERP desktop application using Java Swing. The application supports three user roles—Student, Instructor, and Admin—and provides features such as section registration, class management, grade entry, viewing academic records, and transcript exports.

The system uses **two separate databases**:

1. **Auth DB** – stores usernames, roles, and bcrypt password hashes
2. **ERP DB** – stores academic data: students, instructors, courses, sections, enrollments, grades, settings

A modular, layered architecture is followed: **UI -> API -> Service -> Data -> DB**, ensuring proper separation of concerns and maintainability.

2. System Architecture Overview

2.1 Layered Structure

- **UI Layer (Swing + FlatLaf)**
Contains all screen components, tables, dialogs, and user workflows.
- **API Layer**
A clean set of methods the UI calls (e.g., login, registerSection, enterGrade).
- **Service Layer**
Core business logic, such as access-checking, maintenance checks, validation, and rule enforcement.
- **Data Layer (JDBC + HikariCP)**
Database reading/writing, SQL execution, and connection pooling.
- **Auth Layer**
Handles login verification, bcrypt hashing, password change, and session storage.

- **Utility Layer**

PDF/CSV exports, message helpers, formatting helpers.

2.2 Technologies Used

- Java Swing
 - FlatLaf for Modern UI (IntelliJ OneDark)
 - MigLayout
 - JDBC + HikariCP
 - MySQL / MariaDB
 - jBCrypt (password hashing)
 - OpenCSV
 - PDFBox
 - JUnit 5
 - java.util.logging
-

3. Database Structure

3.1 ERPDB

courses

Field	Type	Null	Key	Default	Extra
course_id	int(10) unsigned	NO	PRI	NULL	auto_incr
code	varchar(10)	NO	UNI	NULL	
title	varchar(150)	NO		NULL	
credits	tinyint(3) unsigned	NO		NULL	
description	text	YES		NULL	
is_active	tinyint(1)	YES		1	

enrollments

Field	Type	Null	Key
enrollment_id	int(10) unsigned	NO	PF
student_id	int(10) unsigned	NO	ML
section_id	int(10) unsigned	NO	ML
status	enum('ENROLLED', 'DROPPED', 'COMPLETED')	YES	
registered_on	datetime	YES	
dropped_on	datetime	YES	
final_grade	varchar(4)	YES	

grades

Field	Type	Null	Key	Default
grade_id	int(10) unsigned	NO	PRI	NULL
enrollment_id	int(10) unsigned	NO	MUL	NULL
component_type	varchar(50)	NO		NULL
component_name	varchar(100)	NO		NULL
score	decimal(7,2)	YES		NULL
max_score	decimal(7,2)	YES		NULL
weightage	decimal(6,2)	YES		0.00
remarks	varchar(255)	YES		NULL
created_at	datetime	YES		current_timestamp

instructors

Field	Type	Null	Key	Default
instructor_id	int(10) unsigned	NO	PRI	NULL
user_id	int(10) unsigned	NO	UNI	NULL
department	varchar(100)	NO		NULL
designation	varchar(50)	YES		Assistant Professor
email	varchar(100)	YES		NULL
phone	varchar(15)	YES		NULL
office	varchar(20)	YES		NULL
joined_on	date	YES		curdate()

notifications

Field	Type
id	int(10) unsigned
sender_user_id	int(10) unsigned
target_type	enum('ALL','COURSE','SECTION','ALL_STUDENTS','ALL_COURSES')
target_id	int(10) unsigned
title	varchar(255)
message	text
created_at	timestamp

sections

Field	Type	Null	Key	Default
section_id	int(10) unsigned	NO	PRI	N
course_id	int(10) unsigned	NO	MUL	N
instructor_id	int(10) unsigned	YES	MUL	N
day_time	varchar(50)	NO		N
room	varchar(20)	YES		N
capacity	smallint(5) unsigned	NO		N
semester	enum('Summer','Winter','Monsoon')	NO		N
year	int(10) unsigned	NO		N
created_at	datetime	YES		c
updated_at	datetime	YES		u

settings

Field	Type	Null	Key	Default
key	varchar(50)	NO	PRI	NULL
value	varchar(100)	YES		NULL
updated_at	datetime	YES		current_timestamp()
updated_by	int(10) unsigned	YES		NULL

students

Field	Type	Null	Key	Default	Extra
student_id	int(10) unsigned	NO	PRI	NULL	auto_increment
user_id	int(10) unsigned	NO	UNI	NULL	
roll_no	varchar(20)	NO	UNI	NULL	
program	varchar(100)	NO		NULL	
year	int(10) unsigned	NO		NULL	
email	varchar(100)	YES		NULL	
phone	varchar(15)	YES		NULL	
join_date	date	YES		curdate()	
graduation_year	int(10) unsigned	YES		NULL	

3.2 AuthDB

users_auth			
Field	Type	Null	Key
user_id	int(10) unsigned	NO	PF
username	varchar(50)	NO	UN
role	enum('ADMIN','INSTRUCTOR','STUDENT')	NO	
password_hash	varchar(255)	NO	
status	enum('ACTIVE','LOCKED','DISABLED')	NO	
failed_attempts	int(10) unsigned	NO	
locked_until	bigint(20)	YES	
last_login	datetime	YES	
created_at	datetime	YES	
updated_at	datetime	YES	

4. Key Features Implemented

4.1 Common Features

- Login with bcrypt password verification
- Appropriate dashboards per role
- Sortable, scrollable tables
- Clear error/success messages
- Automatic blocking under Maintenance Mode

4.2 Student Features

- Browse courses and sections
- Register for a section if allowed
- Drop sections before deadline
- View timetable
- View grades (components + final grade)
- Export transcript (CSV or PDF)

Registration Validations:

- Cannot register twice
- Cannot register if capacity is full
- Cannot register after deadline
- Cannot register when Maintenance Mode is ON

4.3 Instructor Features

- View only their assigned sections
- Add assessment components
- Enter student scores
- Compute final grades using weight distribution
- Export gradebook CSV
- View basic statistics (average, min, max)

Example final grade calculation:

```
A+ : 95–100
A : 90–94.99
A- : 85–89.99
B : 75–84.99
B- : 65–74.99
C : 55–64.99
D : 45–54.99
F : <45
```

4.4 Admin Features

- Add users to Auth DB
- Create ERP profiles (students/instructors)
- Create and edit courses
- Create and edit sections
- Assign instructors to sections
- Toggle Maintenance Mode

5. Access Rules Enforcement

Role	Allowed Actions
Admin	Full access to everything
Instructor	Only their sections & grades
Student	Only their own registrations & records

Before any action, the Service Layer checks:

1. Is user allowed to perform this action?
2. Is Maintenance Mode OFF?
3. Is the action valid (capacity, duplicates, deadlines)?
4. Does the record belong to the user (student/instructor)?

If any check fails, a friendly error message is displayed.

6. Maintenance Mode

Stored in `settings` table as:

```
maintenance = true/false
```

When Maintenance Mode = **ON**:

- Students cannot register or drop sections
 - Instructors cannot enter or edit grades
 - Admin is unaffected
 - A red banner is shown on all restricted screens
 - All modifying API calls return: “Maintenance Mode is ON. This action is temporarily disabled.”
-

7. Workflow Descriptions

7.1 Student Section Registration Flow

1. Student opens course catalog
2. Chooses a section
3. UI calls API → `service.register`
4. Service validates:
 - Maintenance status
 - Access rights
 - Capacity > 0
 - No duplicate
5. Enrollment is created
6. UI refreshes and shows updated timetable

7.2 Instructor Grade Entry Flow

1. Instructor selects a section
2. Views roster
3. Adds assessment components
4. Inputs scores
5. Clicks “Calculate Final Grade”
6. Grades stored to DB

7.3 Admin Maintenance Mode Flow

1. Admin toggles maintenance
 2. DB saved to `settings`
 3. UI of other roles becomes read-only instantly
-

8. Testing Summary

8.1 Acceptance Tests (All Passed)

- Wrong password correctly rejected
- Role-specific dashboards shown
- Student registration worked
- Duplicate enrollment blocked
- Full section blocked
- Drop before deadline allowed
- Grade entry for own sections allowed
- Grade entry for others' sections not possible
- Admin course creation functional
- Maintenance Mode blocks all student/instructor writes
- Transcript export works
- Password hash visible in Auth DB
- ERP DB contains zero password fields

8.2 Edge Case Tests

- Negative capacities blocked
- Registration after deadline blocked
- Unauthorized access attempts blocked
- Section deletion with active enrollments restricted
- Duplicate enrollments prevented

8.3 Security Tests

- No plaintext passwords stored
- bcrypt verification works
- Only user_id + role stored in session
- Failed login attempts handled gracefully

9. Conclusion

The University ERP System meets all core functional, security, and architectural expectations:

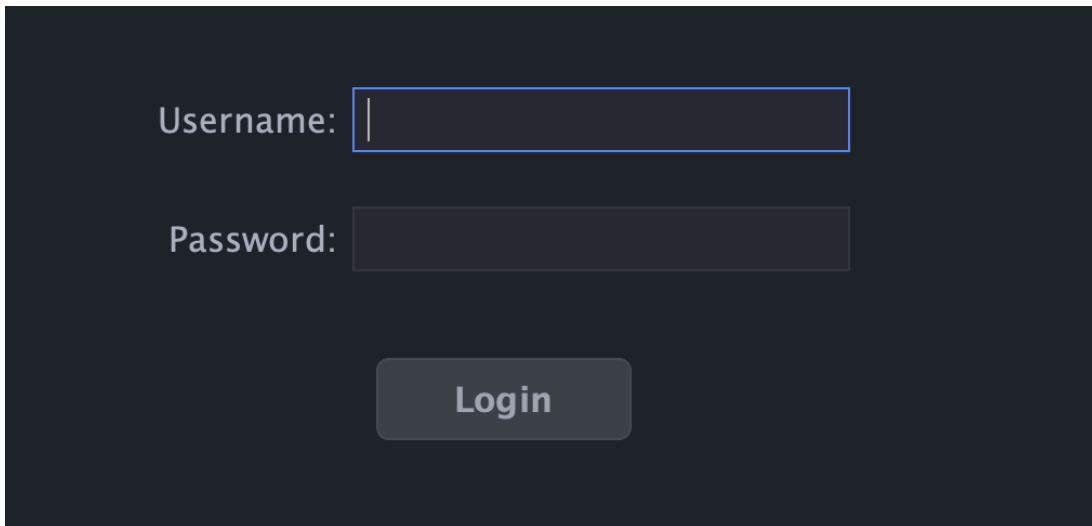
- Secure authentication with bcrypt
- Separation of Auth DB and ERP DB
- Complete workflows for Student/Instructor/Admin
- Proper access control
- Maintenance Mode
- CSV/PDF export functionality
- Responsive and stable UI

Future enhancements:

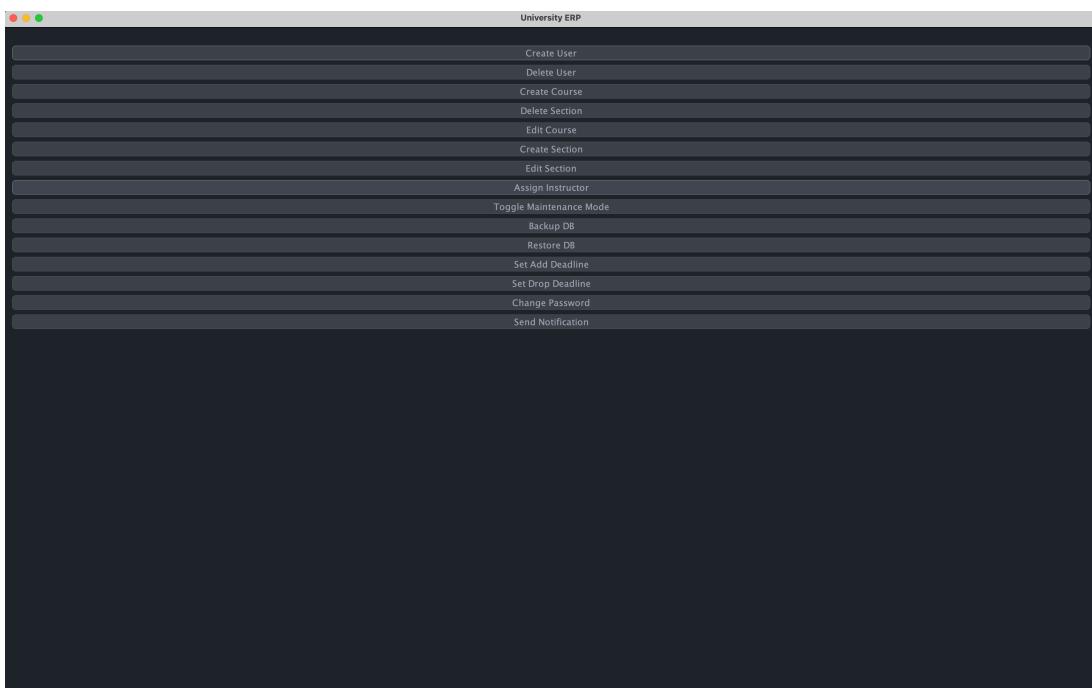
- Notification panel
 - Automated backups
 - Dark mode theme
 - Advanced analytics dashboards
 - Excel export support
-

Appendix - Screenshots

- Login



- Admin



- Instructor

Section ID	Code	Title	Sem	Year	Time	Room
2	CSE201	Advanced Programming	Monsoon	2	Tue/Thu 15:00-16:30	C102
1	CSE121	Discrete Mathematics	Monsoon	2	Mon/Wed 9:00-10:00	B003

Enrollment ID	Roll No.	Student Mail	Status	Final Grade
2	2024072	s2@iitd.ac.in	ENROLLED	-

- Student

ID	Code	Title	Credits
1	CSE121	Discrete Mathematics	3
2	CSE201	Advanced Programming	3

Course Code	Title	Instructor	Credits	Final Grade
CSE121	Discrete Mathematics	i1@iitd.ac.in	3	-

- Transcript PDF

Academic Transcript

Course Code	Title	Credits	Semester	Year	Final Grade	Grade Point
CSE121	Discrete Mathematics	3	Monsoon	2		0

CGPA: 0.00

- TimeTable

Time	Mon	Tue	Wed	Thu	Fri	
8:30						
9:00	Discrete Mathematics, Room: B003		Discrete Mathematics, Room: B003			
9:30	Discrete Mathematics, Room: B003		Discrete Mathematics, Room: B003			
10:00						
10:30						

Closing Steps

```
docker compose down -v  
mvn clean
```