# Course Registration System – Project Documentation

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# Project Description

The Course Registration System is a student-focused and administrator-powered software application
designed using C++ and the Qt GUI framework. It automates the process of course registration,
prerequisite checking, grade management, and academic report generation.

This system ensures:
- Students can register efficiently while meeting prerequisites.
- Administrators can manage course data and student academic records seamlessly.

The system reads data from CSV files at launch and utilizes in-memory data structures to provide fast
access and updates during runtime.

## Key Features

### For Students

1. Course Registration:
   - Search and select available courses.
   - Automatically check and validate course prerequisites before enrollment.

2. View Grades:
   - Display all completed course grades in a friendly GUI format.
   - Includes course name, semester, and grade.

3. Check Prerequisites:
   - View required prerequisites before attempting to register for a course.

4. Generate GPA Report:
   - Auto-generate a report with:
     - Student name and ID
     - All completed courses with grades and semesters
     - Overall GPA

### For Administrators

1. Upload Course Descriptions:

- Upload CSV files containing course ID, name, syllabus, credits, and instructor details.

2. Set Course Prerequisites:
   - Define or update prerequisite mappings via the GUI.

3. Manage Grades:
   - Upload student grades via CSV files.
   - Assign grades to previously registered students.

## Development Details

| Category | Technology |
|---|---|
| Language | C++ |
| GUI Framework | Qt 6.9 |
| IDE | Visual Studio 2022 |
| File Handling | CSV (comma-separated values) |
| Version Control | Git & GitHub |
| Encoding | UTF-8 (supports Arabic & English) |

## Data Structures and Design Choices

This project uses unordered_map from the C++ Standard Template Library (STL) for O(1) access in the following:

- unordered_map<string, Student>: For storing student data using username or ID as the key.
- unordered_map<string, Course>: Maps course ID to course objects, allowing rapid lookup.
- unordered_map<string, Grade>: Links each course ID with the student's grade object.

The use of unordered_map ensures efficiency in real-time registration, prerequisite checking, and report generation.

In addition to unordered_map, the system also utilizes a **queue** to log student actions on the student page.

- queue<string> Student::history: Maintains a record of operations such as course registration, grade viewing, and report generation.

This queue helps track the student's session activity in **chronological order**, making it easier to debug and analyze their interaction flow.

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## Minimum Functional Requirements

- Admin/Student Sign Up and Login
- Student:
  1. Course Search
  2. Course Registration
  3. View Grades
  4. Check Prerequisites
  5. Make GPA Report
- Admin:
  1. Upload Course Descriptions
  2. Set Prerequisites
  3. Manage Grades

## Notes and Constraints

- Read data only once at application startup.
- Perform all logic using internal structures after data load.
- Using STL libraries is allowed.
- Bonus: GUI and grade file upload included.

# Functional Input/Output Scenarios

## ► Function: Upload Student Grad

**- Input: Student ID, Course ID, Semester, Year, Grade Value - Process: Check if student and course exist, update grade map, store in-memory - Output: Grade successfully uploaded message; grade visible in View Grades**

## ► Function: Register Course

**- Input: Student selection from 6 dropdowns, current credit hours**

**- Process: Validate no duplication, check credit limit, add to registration list**

**- Output: Updated registered courses; progress bar reflects total credit**

## ► Function: Generate GPA Report

**- Input: Student clicks Make Report**

**- Process: Loop over completed grades, calculate weighted GPA**

**- Output: Name, ID, list of courses, GPA shown in report page**

## ► Function: Upload Completed Course

- **Input: Student ID, Course ID**

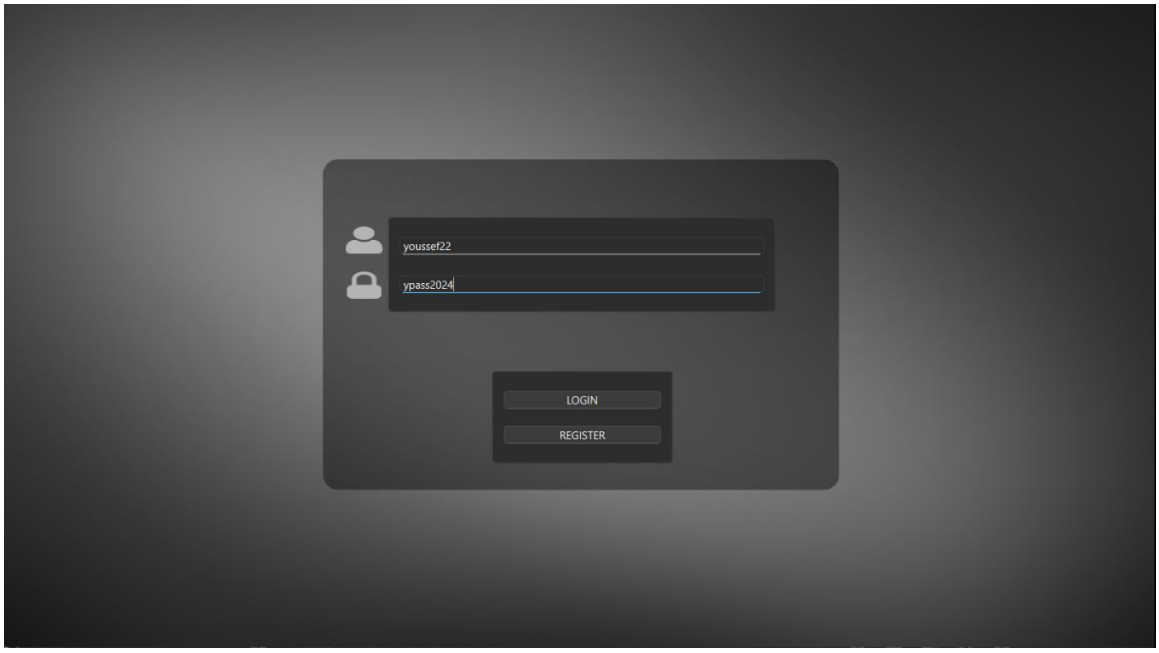
- **Process: Move course from registered list to completed list**

- **Output: Confirmation dialog; UI refreshed with new completion status**

## GUI Screenshots & Descriptions

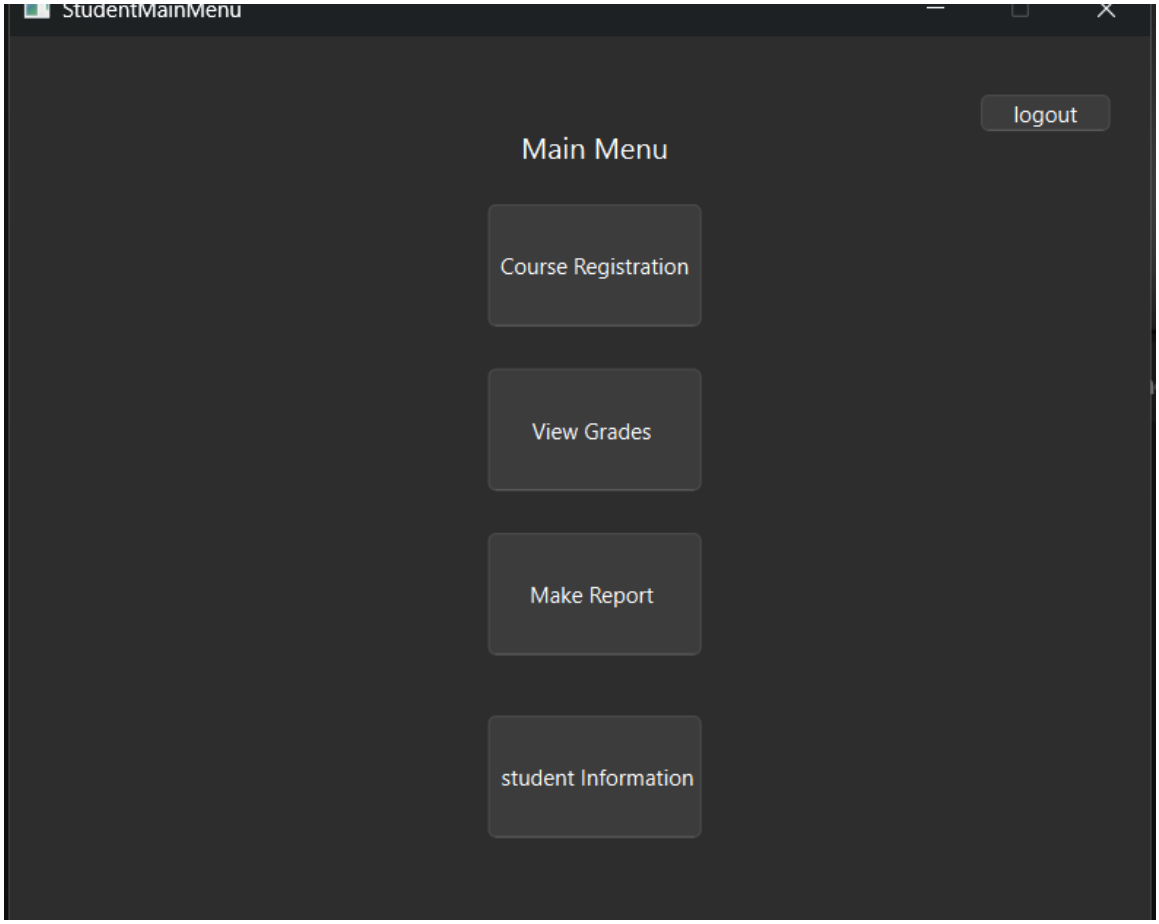
Each screenshot below corresponds to one of the major features in the Course Registration System. The interface is styled using modern black-themed QSS with rounded corners and hover effects.

### Login Page



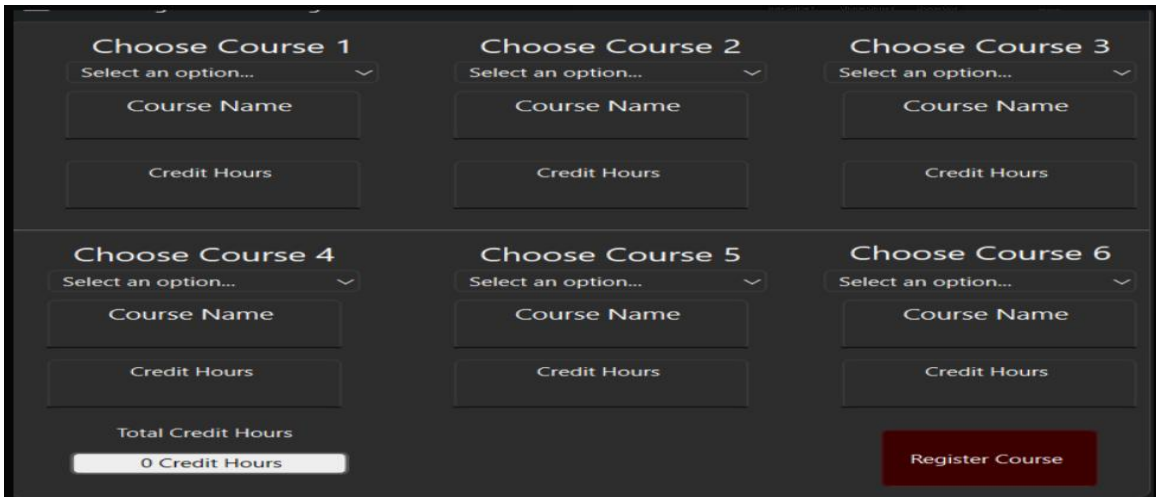

Login and Registration entry point for users.
- Username and Password inputs with icons
- LOGIN and REGISTER buttons
- Modern dark mode with centered layout

## Student Main Menu



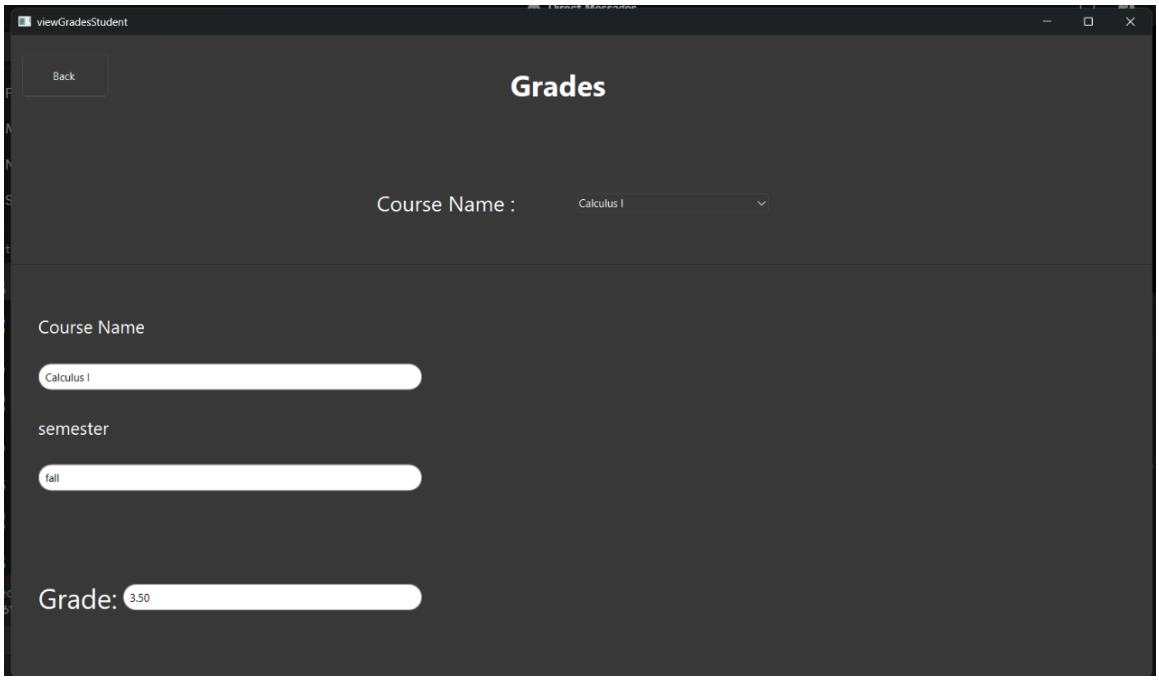

Main navigation menu after student login.
- Buttons: Course Registration, View Grades, Make Report, Student Info
- Styled layout with clean button design
- Logout button styled smaller for minimal intrusion

## Course Registration Page



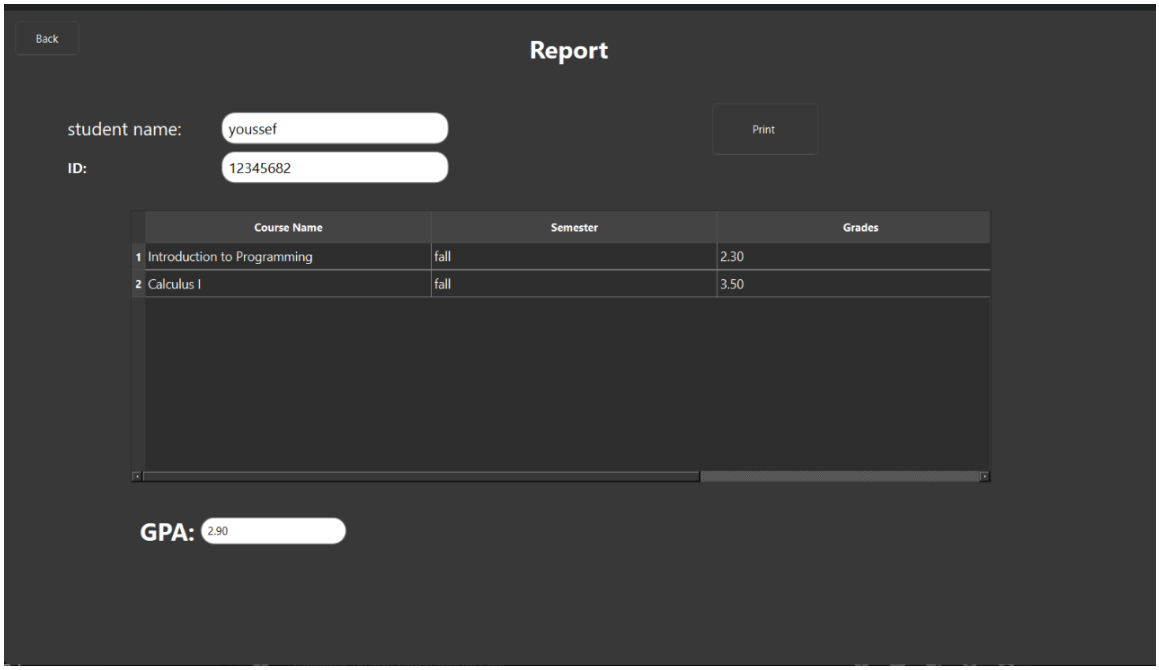
Allows students to register for up to six courses.
- Each course has a dropdown for selection
- Displays course name and credit hours
- Real-time credit hour counter
- Red hover Register button

## View Grades Page




View individual course grades by selecting from dropdown.
- Displays course name, semester, and grade
- Uses QLabel and QLineEdit for data display

## Make Report Page



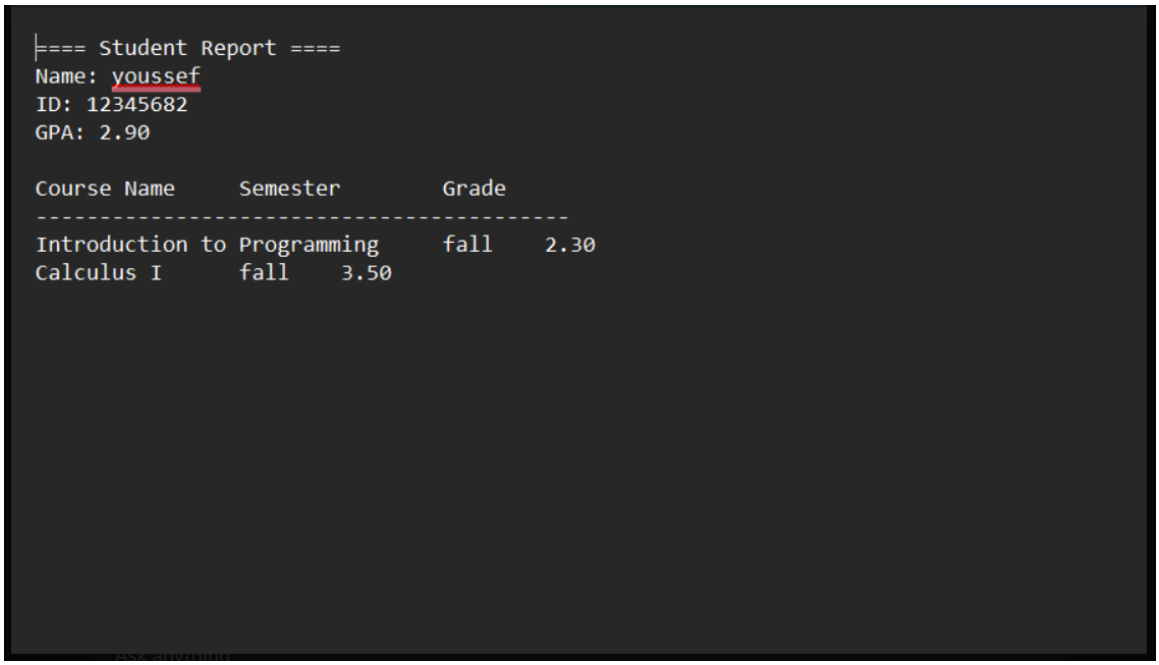

Student can generate a full report with:
- Name, ID
- Completed courses with grades and semesters
- GPA calculation
- Printable format using table layout

## Student Information Page

Overview of student profile and registration status.

- Displays: Name, SID, Username, Password
- Registered and completed courses
- Light-on-dark theme using rows and columns for structure

### Printable Text Report (CLI Format)




Terminal-style formatted student report.
- Includes: Name, ID, GPA
- Course list with semester and grades in tabular format
- Useful for log files or printed plain-text output

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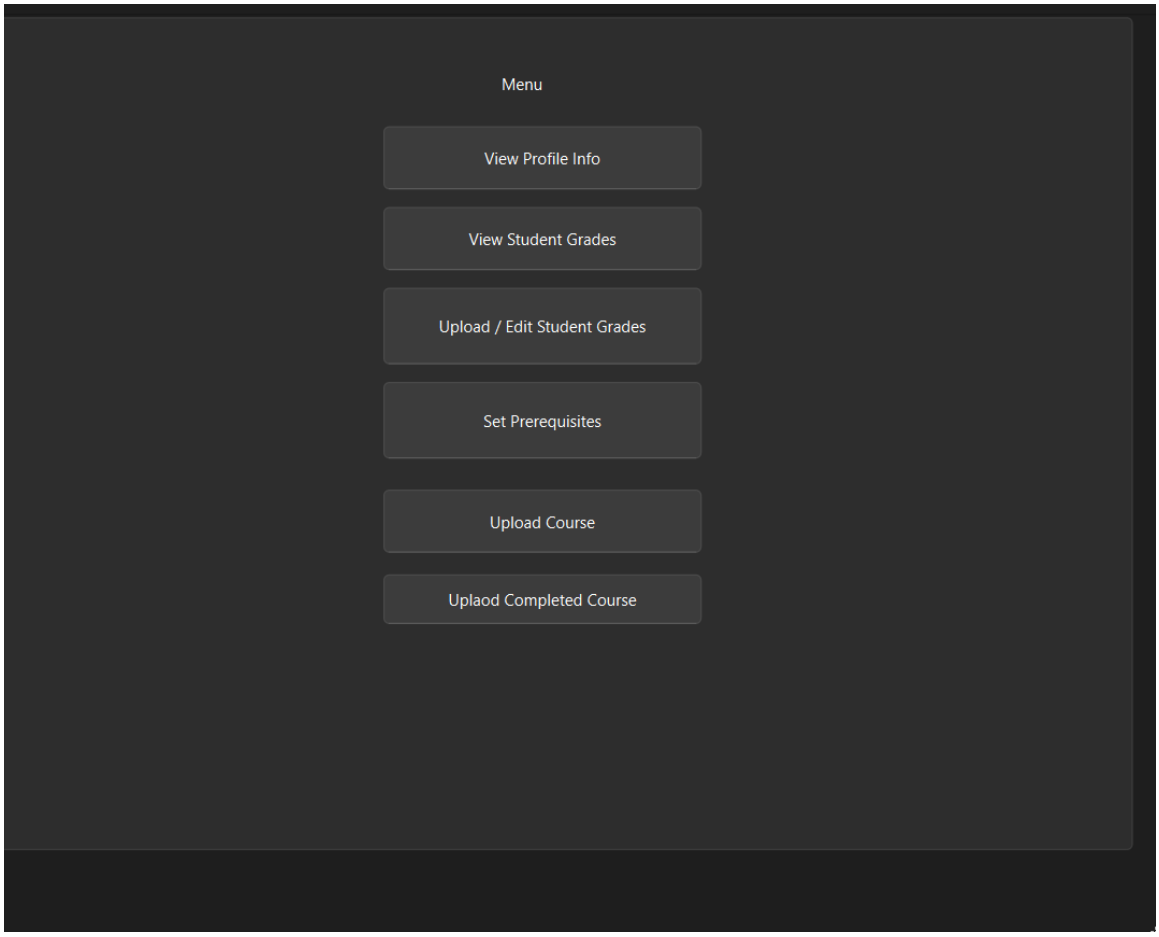
### Admin Menu




This is the main admin dashboard. It provides access to all administrative tasks:

- View profile information
- View or edit student grades
- Set course prerequisites
- Upload courses or completed course records

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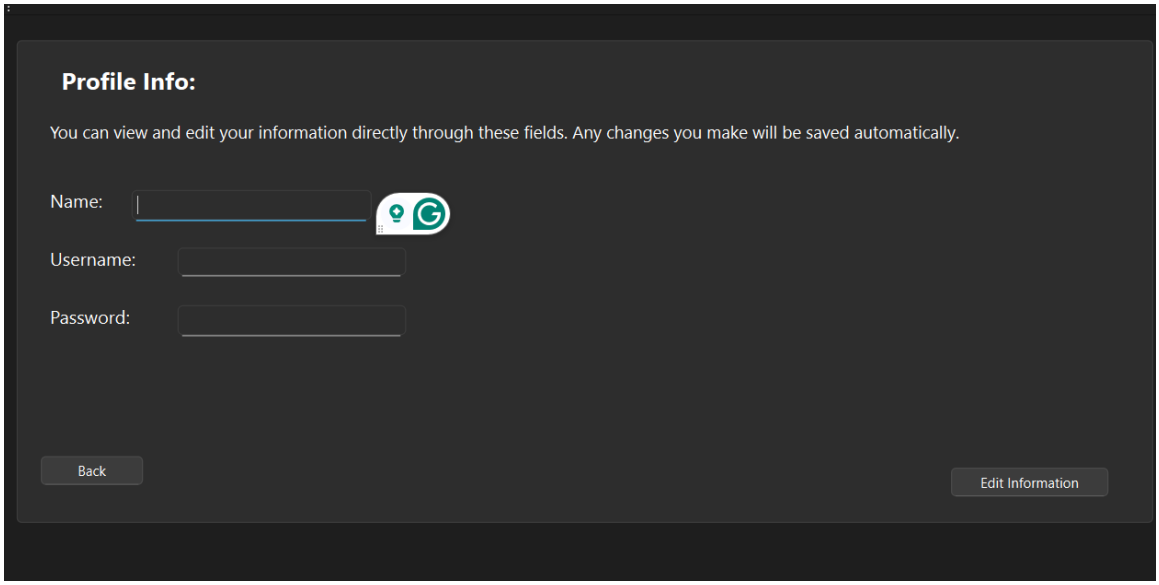
## Profile Info Page




This page allows the admin to:

- View their own name, username, and password
- Edit personal info
- Auto-saves changes as soon as edits are made

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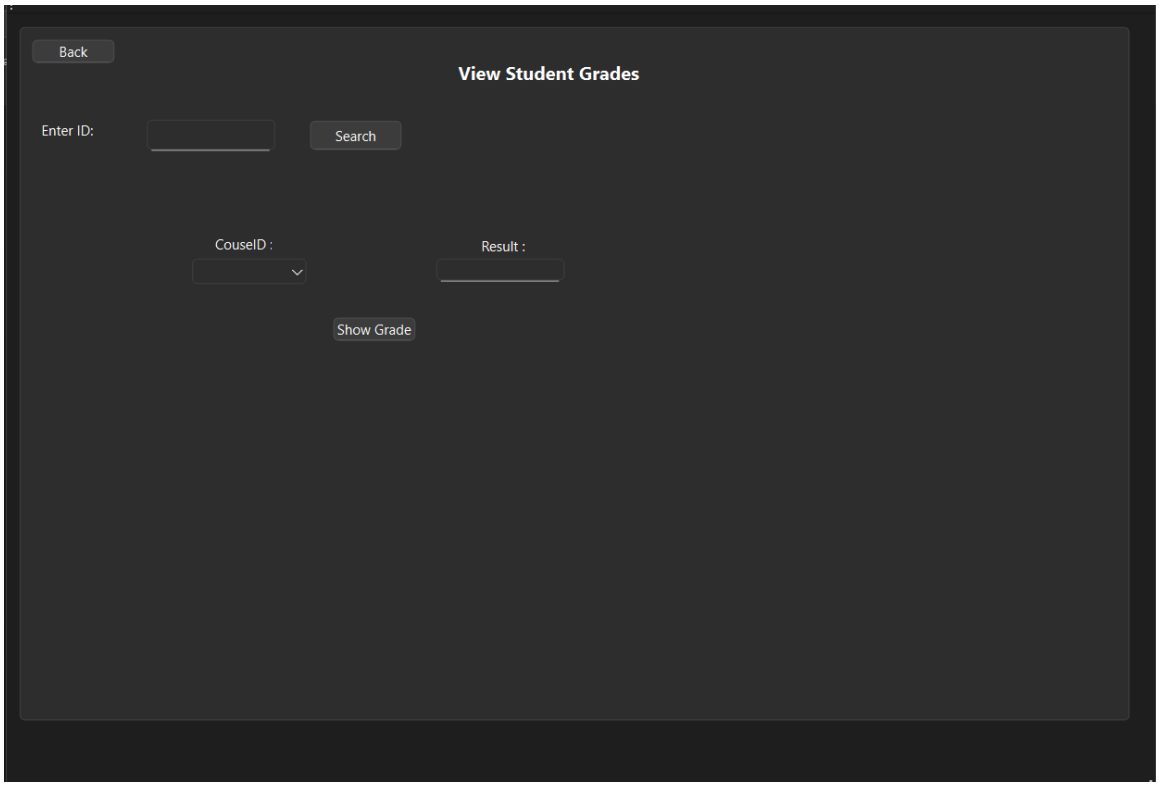
## View Student Grades




This interface lets the admin:

- Search for a student by ID
- Select a course from a dropdown
- View the grade for that course

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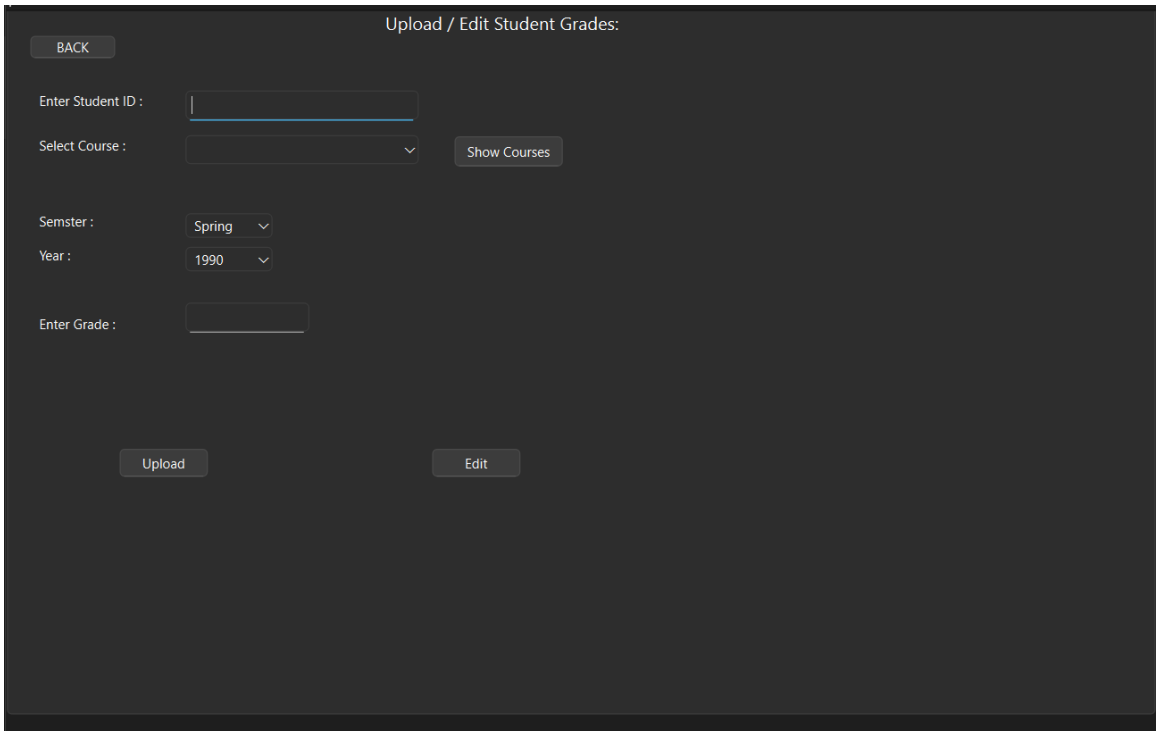
## Upload / Edit Student Grades




Through this form, the admin can:

- Enter student ID
- Select course, semester, and year
- Enter grade and either upload or edit it

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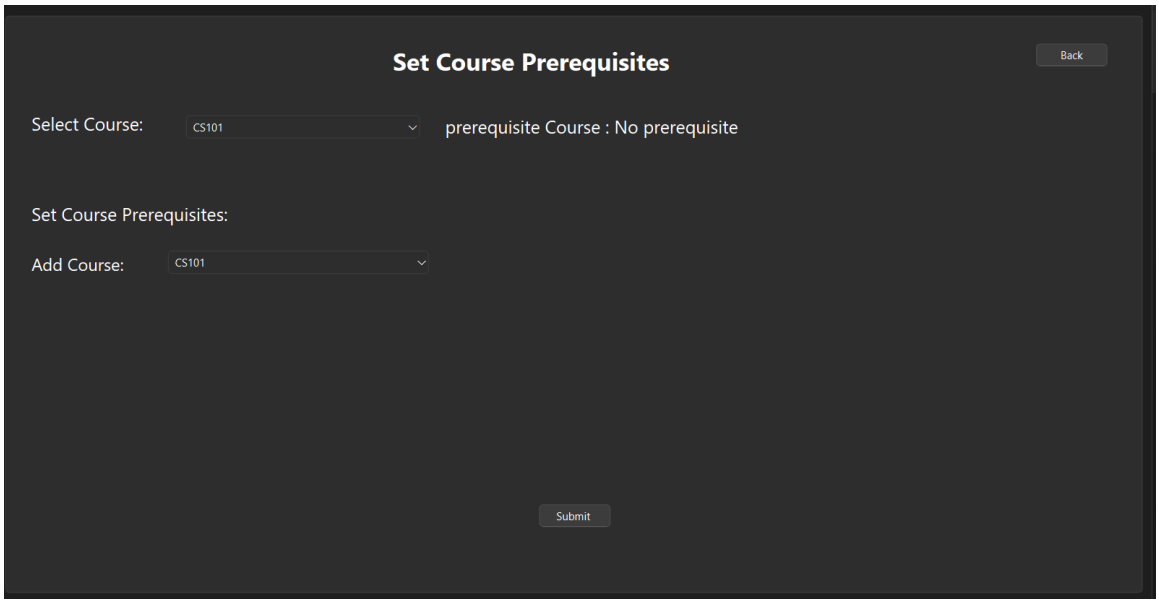
**Set Course Prerequisites**




This page allows the admin to:

- Choose a course
- Assign other courses as its prerequisites
- Prevents circular dependencies

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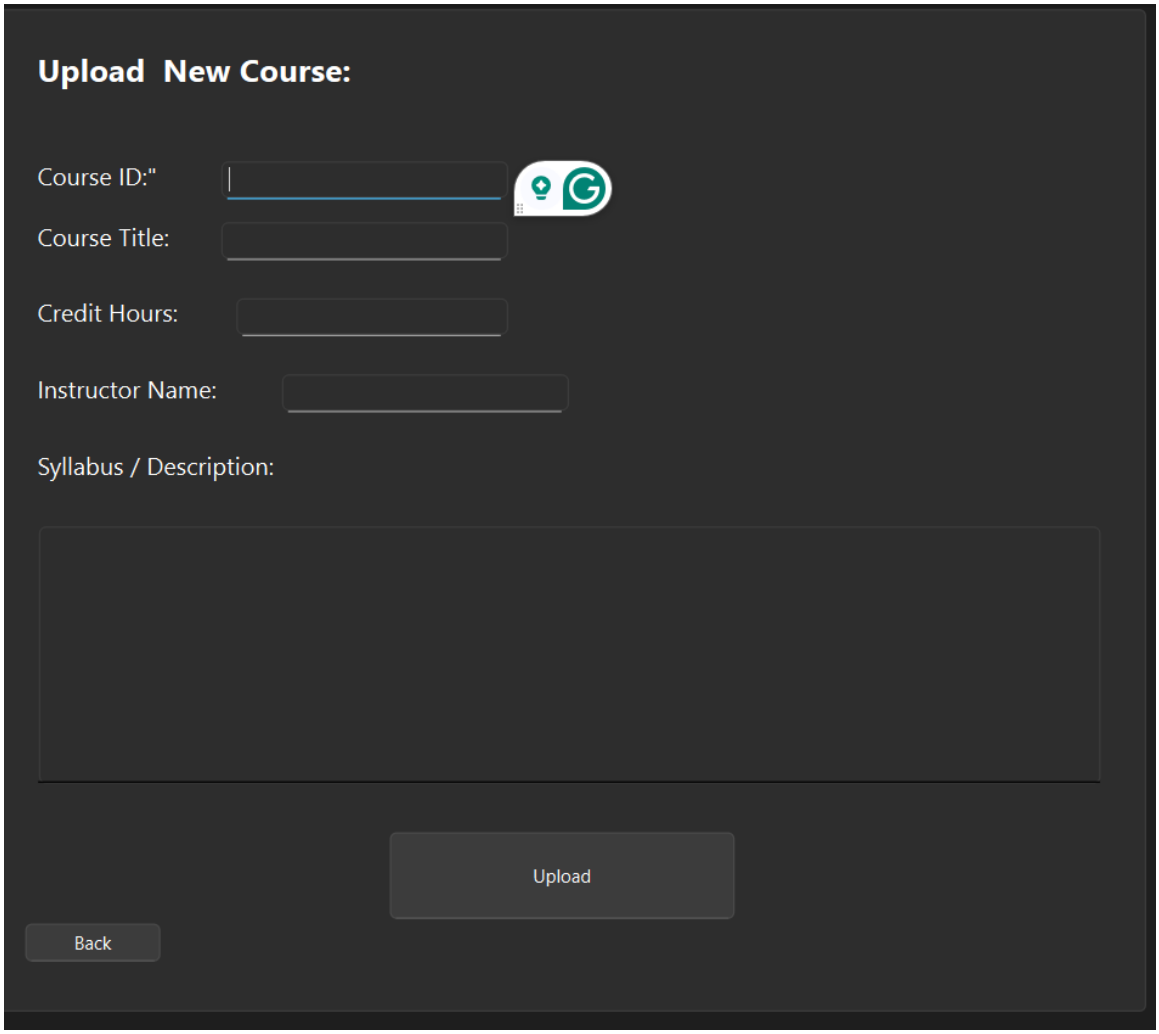
## Upload Course Page




Admins can use this form to:

- Enter a new course's ID, name, credit hours, instructor, and description
- Upload it to the system

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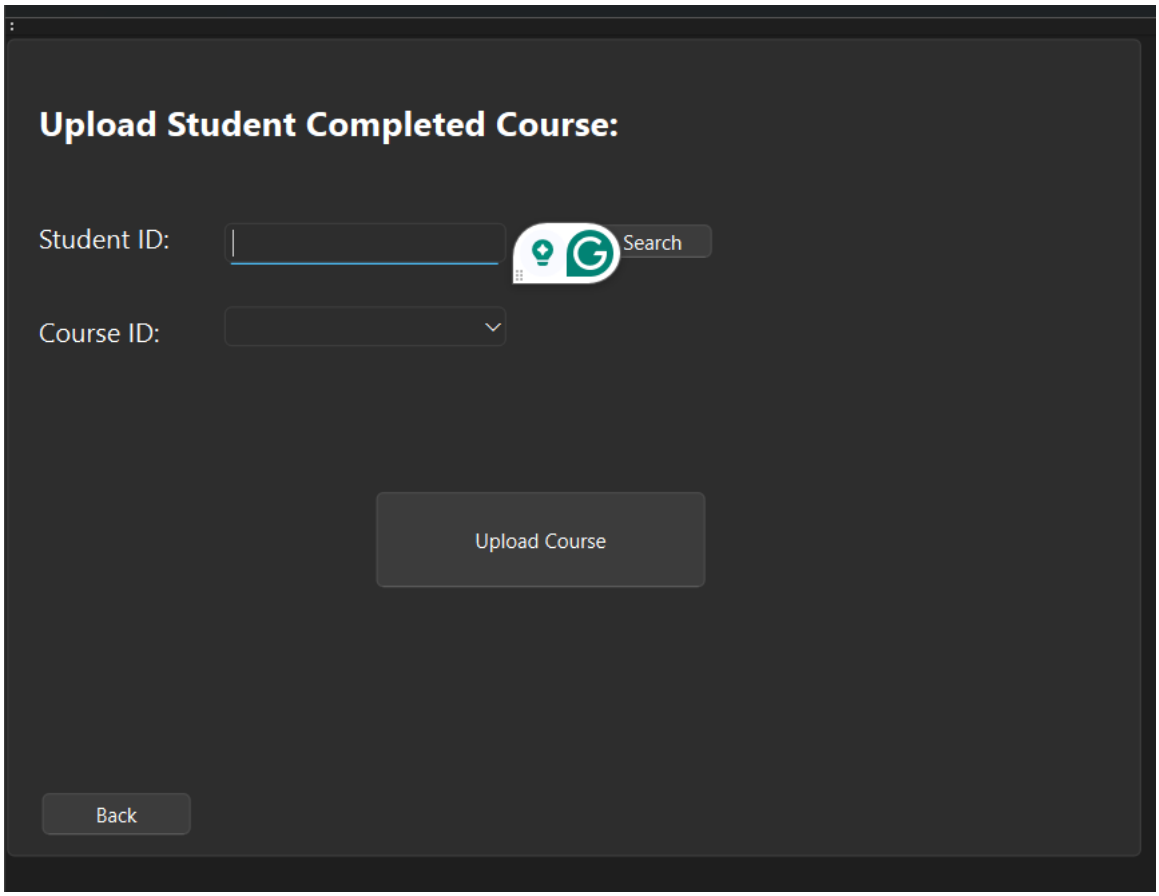
**Upload Student Completed Course**




This window enables:

- Searching a student by ID
- Selecting a course to mark as completed
- Clicking "Upload Course" finalizes the change