

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

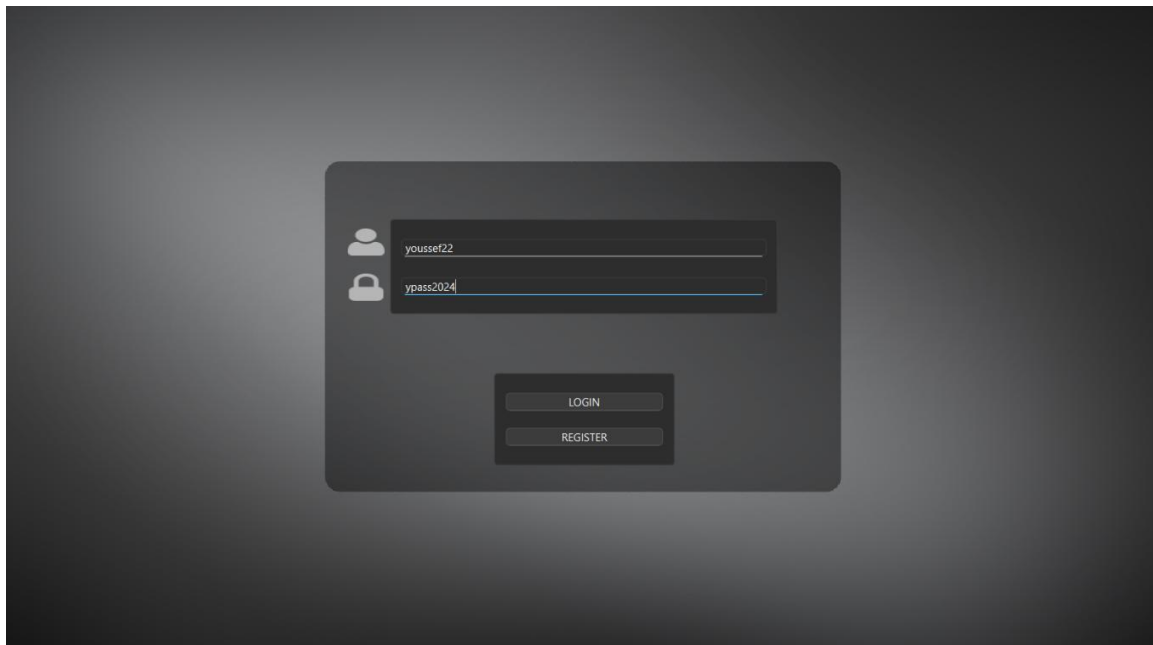
► Function: Upload Completed Course

- 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.

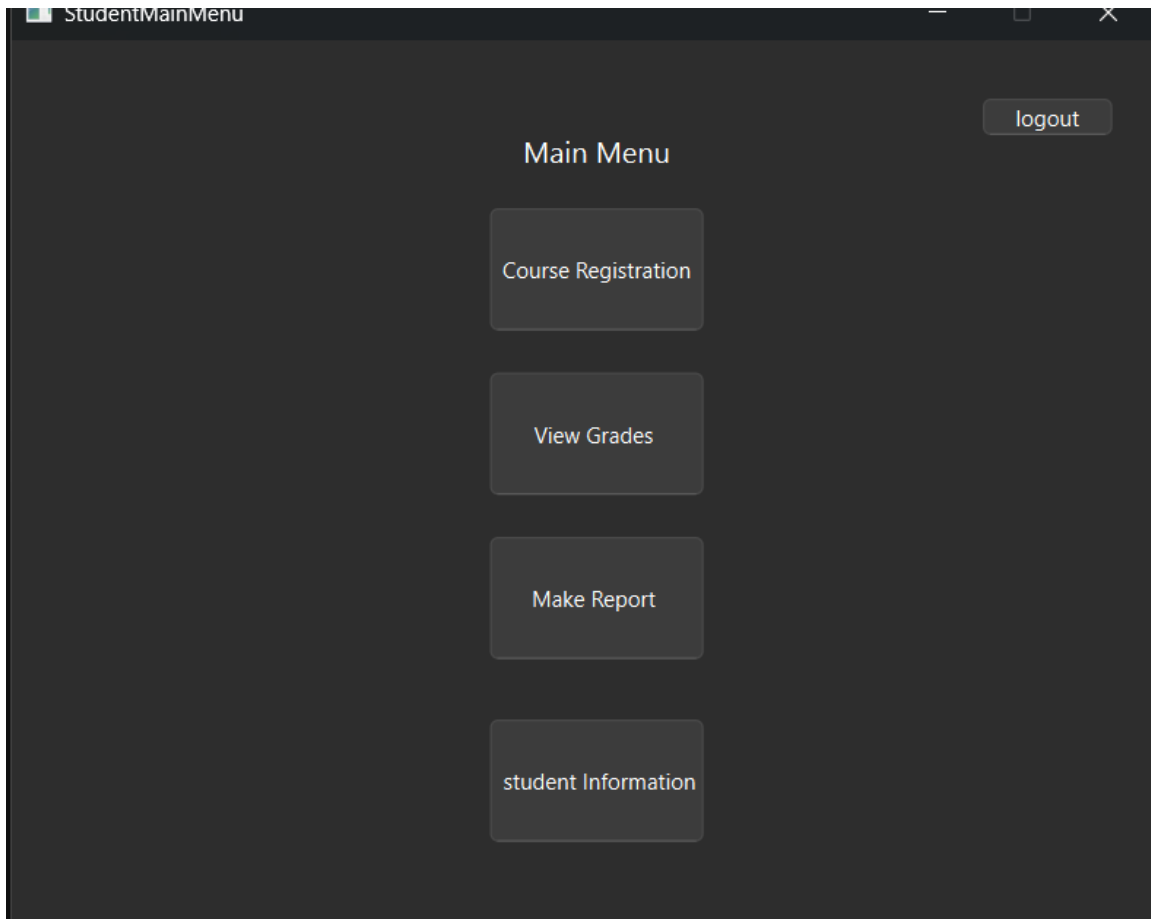
Login Page



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

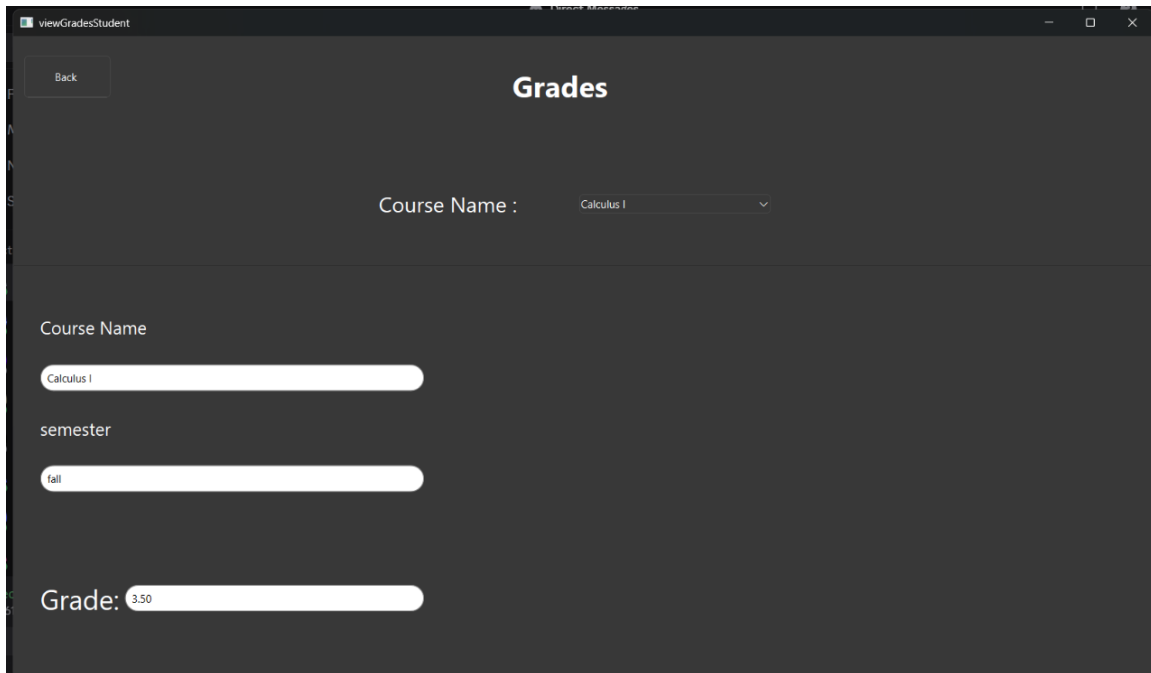
Course Registration Page

A screenshot of a web application window titled "Course Registration Page". The window has a dark gray background. It features six course selection sections arranged in a 2x3 grid. Each section is titled "Choose Course 1" through "Choose Course 6". Each section contains a dropdown menu labeled "Select an option..." with a downward arrow, a "Course Name" input field, and a "Credit Hours" input field. At the bottom left, there is a "Total Credit Hours" label and a display showing "0 Credit Hours". At the bottom right, there is a "Register Course" button.

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



The screenshot shows a Qt application window titled "viewGradesStudent". The window has a dark theme. At the top left, there is a "Back" button. The title "Grades" is centered at the top. Below the title, there is a label "Course Name :" followed by a dropdown menu showing "Calculus I". Below this, there are three input fields: "Course Name" with "Calculus I", "semester" with "fall", and "Grade:" with "3.50".

View individual course grades by selecting from dropdown.

- Displays course name, semester, and grade
- Uses QLabel and QLineEdit for data display

Back

Report

student name:

youssef

Print

ID:

12345682

	Course Name	Semester	Grades
1	Introduction to Programming	fall	2.30
2	Calculus I	fall	3.50

GPA:

2.90

- Name, ID
- Completed courses with grades and semesters
- GPA calculation
- Printable format using table layout

- Name, ID
- Completed courses with grades and semesters
- GPA calculation
- Printable format using table layout

StudentInformation

Name:

youssef

SID

12345682

Username

youssef22

Password

ypass2024

Registered Courses

Currently enrolled Courses : Data Structures, Physics I, Calculus II

Completed Courses

Completed Courses :111 Introduction to Programming, Calculus I

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)

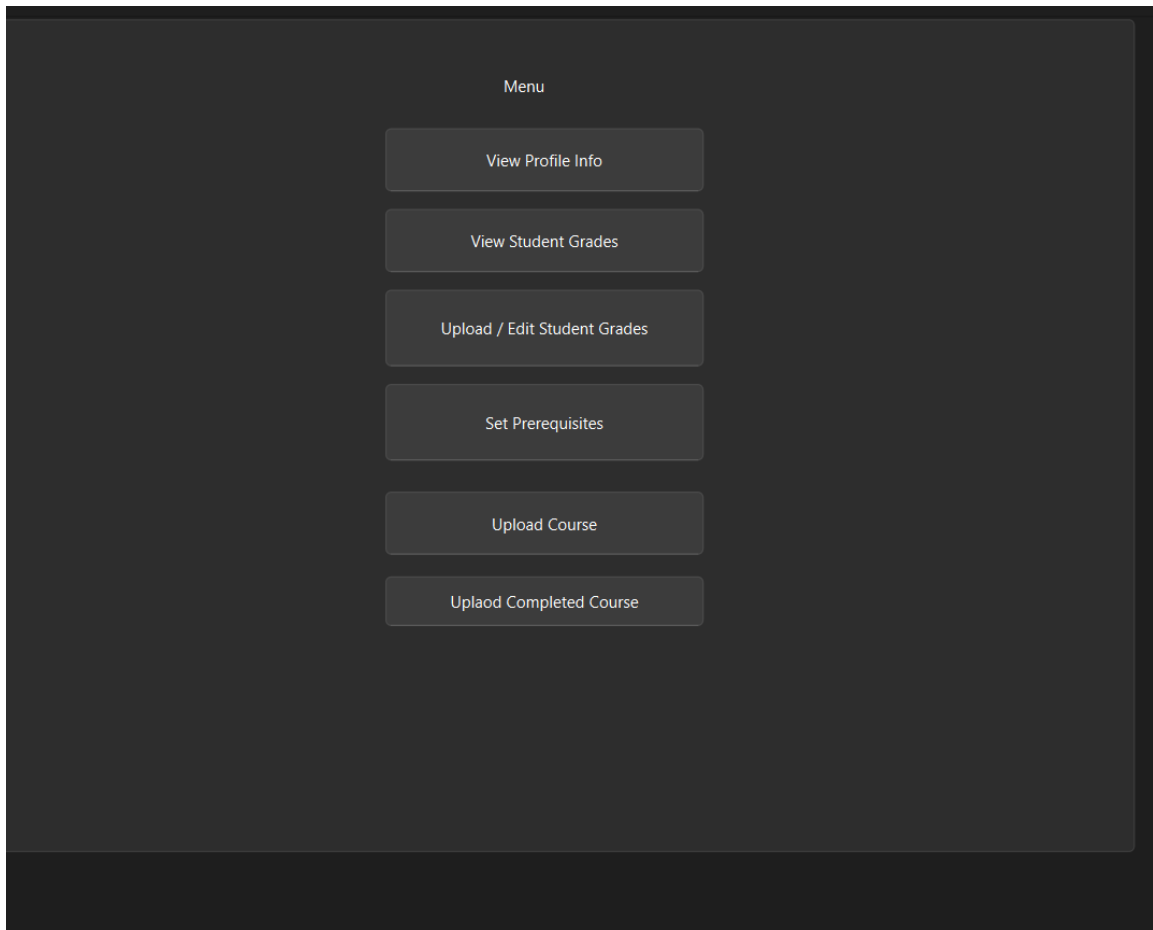
```
|==== Student Report ====
Name: youssef
ID: 12345682
GPA: 2.90

Course Name      Semester      Grade
-----
Introduction to Programming  fall    2.30
Calculus I        fall    3.50
```

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

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

Profile Info Page

Profile Info:

You can view and edit your information directly through these fields. Any changes you make will be saved automatically.

Name:



Username:

Password:

Back

Edit Information

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

View Student Grades

The screenshot shows a web interface titled "View Student Grades". At the top left is a "Back" button. Below the title, there is a search section with the label "Enter ID:" followed by a text input field and a "Search" button. Further down, there is a "CourseID:" label next to a dropdown menu, and a "Result:" label next to a text input field. At the bottom of this section is a "Show Grade" button.

This interface lets the admin:

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

Upload / Edit Student Grades

Upload / Edit Student Grades:

BACK

Enter Student ID :

Select Course :

Show Courses

Semster :

Spring

Year :

1990

Enter Grade :

Upload

Edit

Through this form, the admin can:

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

Set Course Prerequisites

Set Course Prerequisites

Back

Select Course:

CS101

prerequisite Course : No prerequisite

Set Course Prerequisites:

Add Course:

CS101

Submit


This page allows the admin to:

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

Upload Course Page

Upload New Course:

Course ID:"



Course Title:

Credit Hours:

Instructor Name:

Syllabus / Description:

Back

Upload


Admins can use this form to:

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

Upload Student Completed Course

Upload Student Completed Course:

Student ID:

 Search

Course ID:

Upload Course

Back

This window enables:

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

