

Description of Maintenance Work Carried Out

The maintenance activities solved some problems and enhanced the code functionality as well as its readability:

Bug Fix:

- **Problem:** System allowed the entry of student IDs more than once.
 - **Resolution:** Validation was added in the `addNewStudent` method to ascertain that new student IDs are unique. A duplicate is flagged and the operation is aborted with a message.
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Feature Improvement:

- **New Feature:** The system was redesigned to allow deletion of a student by unique ID.
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Implementation:

- A new menu option "4. Remove Student by ID" was included in the main menu.
 - Implemented the `removeStudentById` method which accepts an ID as a parameter, searches for the student with that ID, deletes the student if found, and returns status information on the operation of deletion.
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Code Refactoring:

- **Method Name Changes:** Some methods such as `addStudent` were changed to `addNewStudent` and `displayStudents` were changed to `displayAllStudents`.
 - **Output Order:** The `displayAllStudents` method was refactored to output a properly formatted table with labels to improve clarity.
 - **Comments:** Comments were added with explanations of each method as well as at the class level to provide details on the purpose of the class.
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Impact:

- This bug fix ensures the elimination of duplicates in the students' information database.
- This feature makes it easier to manage students.

Test Cases

Test Case ID	Action	Input	Expected Output	Result
TC1	Add a student	ID: 101, Name: Alice, Age: 20	"Student added successfully!"	Pass
TC2	Add a duplicate student ID	ID: 101	"Error: A student with ID 101 already exists."	Pass
TC3	Display all students (non-empty)	N/A	A formatted table with student details (ID: 101, Name: Alice, Age: 20).	Pass
TC4	Search for a student by ID	ID: 101	"ID: 101, Name: Alice, Age: 20"	Pass
TC5	Search for a non-existing ID	ID: 999	"Student not found."	Pass
TC6	Remove a student by ID	ID: 101	"Student with ID 101 removed successfully!"	Pass
TC7	Remove a non-existing student	ID: 999	"Error: Student with ID 999 not found."	Pass
TC8	Display all students (empty)	N/A	"No students found."	Pass