ICT167 Principle of Computer Science

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# **1. Title**

**Student Management System Documentation:** Authored by Keith Neo Kai Si on March 28, 2024, the Student Management System Documentation provides an overview of the functionalities of the Java-Based Student Management System. The system is designed to handle student data through CSV files and comprises several Java files, including **CsvHandler.java**, **Client.java**, **Student.java**, **Student\_Research.java**, **Student\_Course.java**, **Unit.java**, **Unit\_Course.java**, and **Research.java**. Its core objectives include efficiently loading student information from **student.csv**, adding marks from **student\_marks.csv**, student removal, information display, and exporting organized student data to a CSV file. Employing Java’s object-oriented programming principles, such as inheritance and polymorphism, the system effectively models various student types and their enrolment in different units. Furthermore, the documentation elaborates on Java’s file-handling capabilities, illustrating the system’s CSV file reading and writing processes for sustained data integrity. This comprehensive guide serves as a valuable reference for developers seeking to implement or enhance student management systems using Java.

# **2. Requirements/Specification**

The Student Management System is created to effectively handle and manage student information, such as importing student details from CSV files, adding marks to students, deleting students, displaying student information, and exporting organized student data back to a CSV file. The system assumes that the input CSV files are correctly formatted, with student.csv containing student type, name, and ID and student\_marks.csv containing student IDs followed by marks or course and marks. The desired output is a sorted list of students with their marks included, which can be saved to a new CSV file.

The system’s design utilizes fundamental object-oriented programming concepts:

**1. Inheritance**: The Student class acts as the base class, with Student\_Research and Student\_Course extending it to represent different types of students. This allows for reusing code and adding specific attributes and methods for research and course students.

**2. Polymorphism**: The reportGrade method in both Student\_Research and Student\_Course classes overrides the reportGrade method in the Student class, showcasing polymorphism. This enables different implementations of the method based on the student type.

**3. Dynamic Binding**: The system employs dynamic binding to determine the appropriate method to call at runtime. For instance, when calling reportGrade on a student object, the JVM decides whether to call the Student, Student\_Research, or Student\_Course implementation based on the actual type of the student object.

**4. Sorting Algorithm**: The system utilizes an insertion sort algorithm to arrange students by their IDs. This is done using the sortStudents method, which sorts the list of students in ascending order of their IDs.

**5. Handling CSV Files**: The system uses Java’s built-in Scanner class to read from CSV files. It reads each line of the student\_marks.csv file, separates the line into components based on the comma separator, and processes the data accordingly. For writing to a CSV file, the system uses PrintWriter to output the sorted list of students to a new file.

This documentation presents a comprehensive overview of the requirements, specifications, and implementation details of the Student Management System, ensuring that developers and users comprehend the system’s functionality and how it fulfills the specified needs.

# **3. User Guide**

**Compilation and Execution:**

1. **IDE:** [Eclipse IDE 2024-03](https://www.eclipse.org/downloads/packages/installer) is used for this program.

2. **Compilation:** To begin compiling the Java program in Eclipse, first open the Eclipse IDE on your computer. After launching Eclipse, navigate to the top left corner and click “File.” Select " New " from the dropdown menu and click “Java Project.” In the “New Java Project” menu, enter a name for the project, such as “Assignment\_2”. Make sure to deselect the “Use default location” option, and then navigate to the folder where the Java source codes are stored, “ICT167-Assignment-2-Keith-Neo-35107628”. Inside this folder, find the “java\_codes” folder and select it as the location for the new project. Ensure that the “Create module-info.java file” option is not checked. Once all the settings are configured, click “Finish” to finalize the process.

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3. **Execution:** Navigate to the Package Explorer panel after successfully creating the Java project in Eclipse. Right-click on the Java project that was made. From the dropdown menu that appears, select “Run As” and then choose “Java Application.” This action will execute the Java program within the Eclipse environment.

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**Using the Program:**

* When the program is launched, users will receive a welcome message containing student information, indicating the current student profile that developed the program. After the student information, users will be presented with the program's main menu, providing various options for interacting with student data and carrying out different tasks.

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* If the user enters nothing, letters, or unknown options, the system will display “Invalid input. Try again.” Or “Unknown choice. Try again.” This will prompt the user to retry the input.

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* If option 1 is selected, the program will exit and display a farewell message

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* If option 2 is selected, the program will dynamically aggregate the marks and units (for course students). The program will display “Student <count> marks loaded” for each student, dynamically loading the marks based on the student type from student\_marks.csv. It’s important to note that marks for course students contain a unit, while marks for research students do not include a unit. Upon completion, the program will display “Student marks loaded,” indicating that all the student marks have been successfully loaded.

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* If option 3 is chosen, the program will ask the user to input a student ID for deletion. If the user enters nothing, the program will exit this option and return to the main menu. If the user enters letters, the program will display “Invalid ID. Try again.” The program will attempt to locate the student if a valid student ID is entered. If the student is found, the program will display “Student found.” And present a confirmation option to the user. If the student is not found, the program will display “Student not found. Try again.” And prompt the user for another student ID.

Once the student is found and the user is at the confirmation menu, selecting “yes” or “y” (not case-sensitive) will result in the program removing everything related to the student and displaying “Student removed.” Choosing “no” or “n” will display “Student not removed.” After this, the program will display the main menu.

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**A computer screen shot of a computer error

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**A computer screen shot of a computer error

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* If option 4 is chosen, the program will display each student's type, full name, and student number. If option 2 (Add marks from file) is previously selected, resulting in the student marks being loaded, the program will display the Unit ID for course students and the string “Has Unit” for research students.

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* If option 5 is chosen, the program will show the number, of course, students who scored equal to or higher than the average, as well as the number of course students with scores lower than the average. The program will only display these numbers if option 2(Add marks from file) was previously selected. If option 2 was not previously selected, the program will display 0 for each count.

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* If option 6 is chosen, the user will be asked to enter a student ID to view the student report. If the user enters a letter, an error message will be displayed, prompting the user to enter the student ID again. Upon entering a valid student ID, the program will attempt to find the student with the given ID. If the student is not found, the program will prompt “Student not found. Try again” and ask the user for the student ID again. If the student is found, the program will display the student's information using the reportGrade() function. However, if option 2 (Add marks from file) was not previously selected, the program will display “Student marks not loaded” and return to the main menu.

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* If option 7 is chosen, the program will use the insertion sort algorithm to sort the student array list based on the student’s IDs. Upon completion of the sorting process, the program will display “Student sorted.”

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* If option 8 is chosen, the student array list will only be saved if option 7 was previously selected to sort the students in ascending order. If the student array list is not sorted, the program will display “Student not sorted” and return to the main menu. If the student array list is sorted, the program will indicate that the sorted student array list has been saved to “csv\_files/sorted\_students.csv.”

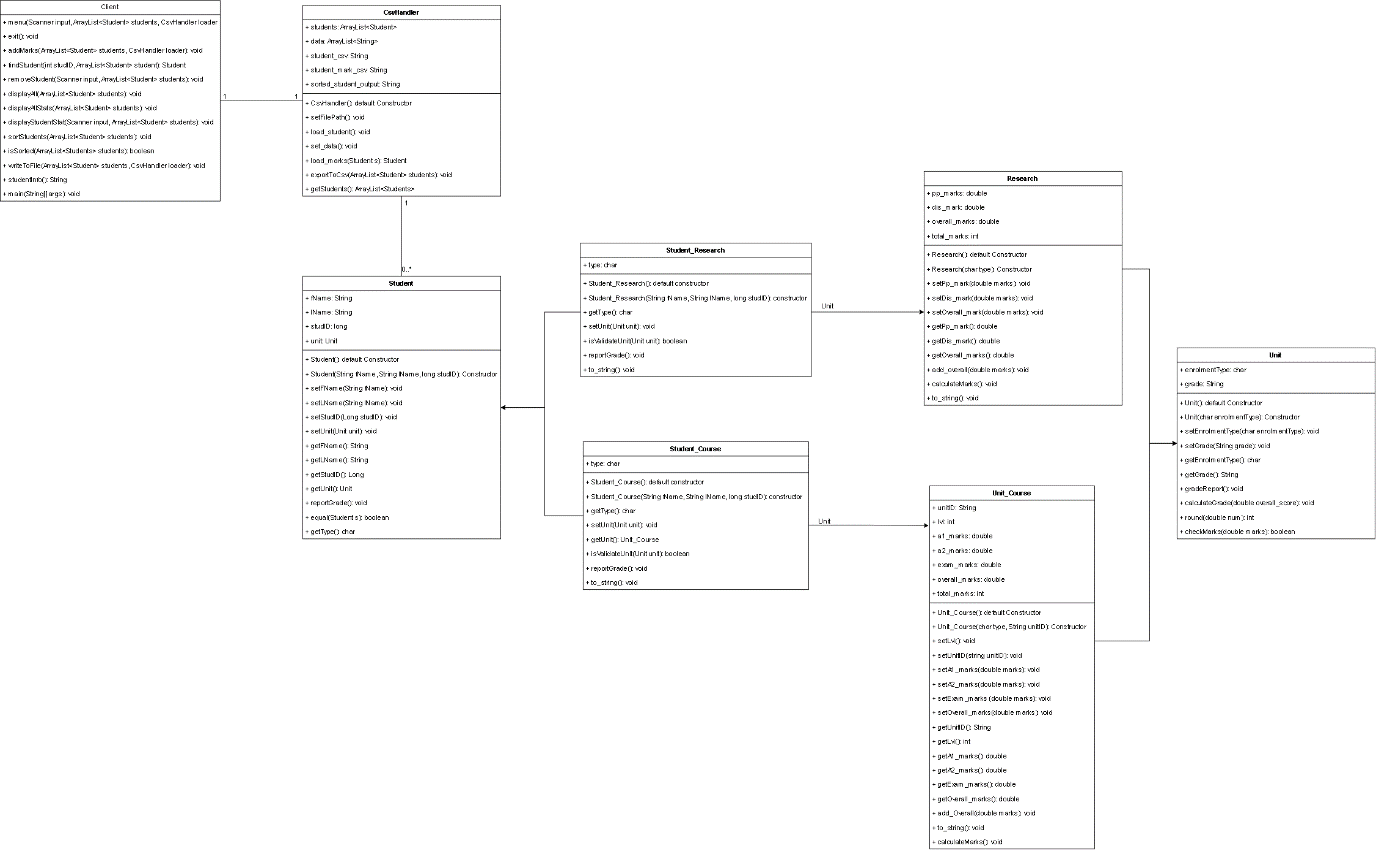
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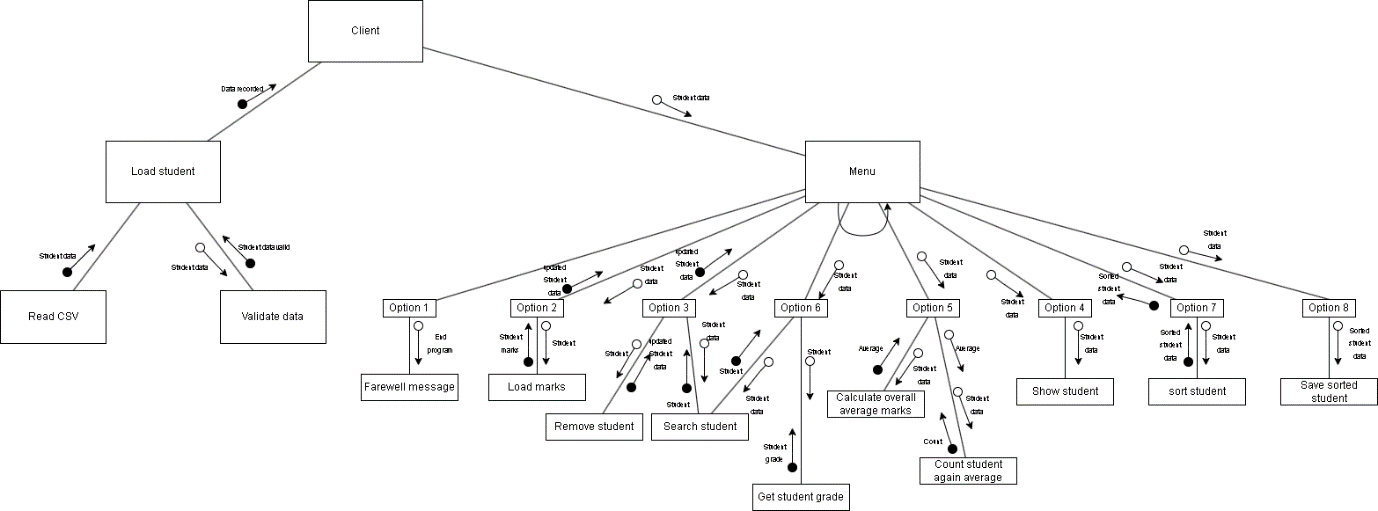
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**4. Structure/Design/Algorithm**

**UML for the Client program**

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**Structure chart for the Client program**



# **5. Limitations**

# **6. Testing**