

## 4. Technology Stack

- **Programming Language:** Java
- **Frameworks/Libraries:** Java Swing (for GUI), JDBC
- **Database:** MySQL

## 5. OOP Concepts Implementation

- **Encapsulation:**  
Each class will have private data members and public getters/setters (e.g., `Vehicle`, `User`, `Booking` classes).
- **Inheritance:**  
Common attributes like ID, name, and contact can be inherited by Admin and Customer classes from a base `User` class.  
Different vehicle types (e.g., Car, Bike) will inherit from a parent `Vehicle` class.
- **Polymorphism:**
  - Method Overloading: e.g., `searchVehicle()` with different parameters (by type, by model, etc.).
  - Method Overriding: `displayInfo()` method overridden in child classes for specific outputs.
- **Abstraction:**  
Abstract classes or interfaces for operations like `Payment`, `Rentable` will hide complex implementation and provide common behavior across modules.

## 6. Project Phases and Timeline

## 7. Expected Outcome

The final product will allow users to register, rent vehicles, and manage bookings digitally. Admins can manage vehicles and monitor the system. This tool simplifies the rental process, improves accessibility, and ensures efficient record-keeping.

## 8. Conclusion

The **Smart Vehicle Rental System** combines Java and Object-Oriented Programming to solve a real-world problem. It demonstrates the practical application of OOP principles and serves as a comprehensive software solution for the vehicle rental industry.

## 9. References

- Java Documentation – <https://docs.oracle.com/javase/>
- MySQL Documentation – <https://dev.mysql.com/doc/>
- TutorialsPoint: Java OOP – [https://www.tutorialspoint.com/java/java\\_object\\_classes.htm](https://www.tutorialspoint.com/java/java_object_classes.htm)
- GeeksForGeeks Java Tutorials – <https://www.geeksforgeeks.org/java/>

## 10. Development Progress So Far

### Screenshots:

Please upload your current screenshots so I can help explain them in detail.

### Features Developed So Far:

- Login and Registration GUI
- Admin Dashboard
- Vehicle List Display
- Add Vehicle Form
- Booking Logic (basic)

### Features Remaining:

- Payment Simulation
- Rental History
- Return Vehicle Flow
- Fine Calculation for Late Returns
- Email/Notification Integration (optional)

### New Learnings and Challenges:

- Learned Java Swing and JDBC integration
- Faced difficulty with layout managers in Java Swing
- Faced database connection errors and solved by setting correct JDBC driver and path