Software Modelling - UML Use Case and UML Class diagrams

Table

Description automatically generated

1. Identify the use-cases for the software. Draw the \*\*UML use-case diagram \*\*and include supporting use-case descriptions. At-least 3 scenarios must be identified.
2. Identify the objects and their respective classes. Draw the \*\*UML class diagrams \*\*and include supporting descriptions to explain the relationships. At-least 4 classes and respective relationships must be identified.
3. For all the identified classes create \*\*Python classes \*\*with the constructor, attributes, and appropriate setter/getter methods. Each class must include at-least 5 attributes. Create objects of all the identified classes and use the object’s functions to populate and display the details.

Use Cases:

* Generating receipts
* Managing vehicle information
* Managing customer information
* Calculating taxes and discounts
* Repairing vehicles

Use Case Diagram:



Billing Management System

Cashier

Customer

Mechanic

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| Use Case: | Generating Receipts |
| Trigger: | The costumer wants to get a receipt |
| Precondition: | The customer has received services from the auto repair shop |
| Main Scenario: |  |
| 1. | The employee selects the "Generate Receipt" use-case |
| 2. | The system displays a form to enter the customer information, vehicle information, and services provided |
| 3. | The employee enters the information and clicks "Generate Receipt" |
| 4. | The system generates a receipt and displays it on the screen |
| 5. | The employee prints the receipt and hands it to the customer. |
| Exceptions: |  |
| 3a. | 1. The employee enters invalid data for customer or vehicle information. 2. The system displays an error message and prompts the employee to enter valid data. |
| 3b. | 1. The employee selects a service that is not available. 2. the system displays an error message and prompts the employee to select a valid service. |
| 4a. | 1. There is an error during the receipt generation process. 2. The system displays an error message and prompts the employee to try again. |

Use Case Description 1:

Use Case Description 2:

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| Use Case: | Manage Customer Information |
| Trigger: | The auto repair shop needs to update or add customer information to maintain accurate records. |
| Precondition: | The auto repair shop has customer information that needs to be managed. |
| Main Scenario: |  |
| 1. | The employee selects the "Manage Customer Information" use-case. |
| 2. | The system displays a list of existing customers. |
| 3. | The employee selects a customer from the list or adds a new customer. |
| 4. | The system displays a form to update or add the customer information. |
| 5. | The employee updates or adds the information and clicks "Save". |
| 6. | The system saves the information and displays a confirmation message. |
| Exceptions: |  |
| 3a. | 1. There are errors during the retrieval of existing customer information. 2. the system displays an error message and prompts the employee to try again. |
| 5a. | 1. There are errors during the update or addition of customer information. 2. The system displays an error message and prompts the employee to try again. |

Use Case Description 3:

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| Use Case: | Calculate Taxes and Discounts |
| Trigger: | The employee needs to provide the customer with an accurate invoice. |
| Precondition: | The services have been provided to the customer. |
| Main Scenario: |  |
| 1. | The employee selects the "Calculate Taxes and Discounts" use-case. |
| 2. | The system retrieves the services provided and their prices. |
| 3. | The system calculates the total cost of the services. |
| 4. | The system calculates the taxes based on the total cost and the tax rate. |
| 5. | The system applies any applicable discounts to the total cost. |
| 6. | The system displays the total cost, taxes, discounts, and the final amount to the employee. |
| Exceptions: |  |
| 2a. | 1. There are errors during the retrieval of service prices or tax rates. 2. The system displays an error message and prompts the employee to try again. |
| 3a. | 1. There are errors during the calculation of the total cost, taxes, or discounts. 2. The system displays an error message and prompts the employee to try again. |
| 6a. | 1. There are errors during the display of the total cost, taxes, discounts, and final amount. 2. The system displays an error message and prompts the employee to try again. |

The 3 scenarios:

1. James W. Jones received services from the auto repair shop, and an employee generated a receipt for him.
2. An employee added a new customer to the auto repair shop's database and updated their information.
3. An employee calculated the taxes and discounts for the services provided to a customer, and the customer received a discounted final amount.

Classes:

1. Person:

* First Name: String
* Last Name: String
* Gender: ENUM
* Phone Number: String
* Date of Birth: Date

1. Customer:

* Email Address: String
* Billing Address: String
  + Customer1:
    - First Name: James
    - Last Name: W. Jones
    - Gender: Male
    - Phone Number: 816-897-9862
    - Date of Birth: 6-6-1996
    - Email Address: Jamesjones@gmail.com
    - Billing Address: Dubai

1. Cashier:

* Employee ID number: Integer
* Register number: Integer
* Manager name: String
  + Cashier1:
    - First Name: John
    - Last Name: Smith
    - Gender: Male
    - Employee ID number: 01234
    - Register number: 56789
    - Manager name: Tim A.

1. Mechanic:

* Areas of expertise: String
* Years of experience: Integer
  + Mechanic1:
    - First Name: Hans
    - Last Name: K
    - Gender: Male
    - Areas of expertise: Repair
    - Years of experience: 10

1. Vehicle:

* Make: ENUM
* Model: ENUM
* Year: Integer
* Color: ENUM
* Vehicle ID: String
  + Vehicle1:
    - Make: Nissan
    - Model: Altima
    - Year: 2014
    - Color: Silver
    - Vehicle ID: AD-89034

1. Service:

* Vehicle
* Service name: ENUM
* Service price: Integer
* Mechanic name: String
* Service status: ENUM
  + Service1:
    - Vehicle: Vehicle1
    - Service name: Diagnostics
    - Service price: 15
    - Mechanic name: Hans
    - Service status: Complete
  + Service2:
    - Vehicle: Vehicle1
    - Service name: Oil replacement
    - Service price: 120
    - Mechanic name: Hans
    - Service status: Complete
  + Service3:
    - Vehicle: Vehicle1
    - Service name: Oil filter parts
    - Service price: 35
    - Mechanic name: Hans
    - Service status: Complete
  + Service4:
    - Vehicle: Vehicle1
    - Service name: Tire replacement
    - Service price: 100
    - Mechanic name: Hans
    - Service status: Complete
  + Service5:
    - Vehicle: Vehicle1
    - Service name: Tire
    - Service price: 160
    - Mechanic name: Hans
    - Service status: Complete

1. Receipt

* Cashier name: String
* Date: Date
* Total services: Integer
* Taxes: Float
* Discount: Float
* Total cost: Integer
  + Receipt1:
    - Cashier name: John Smith
    - Date: March 13, 2022
    - Total services: 5
    - Taxes: 21.5
    - Discount: 11.5
    - Total cost: 440

UML class diagrams:

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| **Person** |
| firstName: String  lastName: String  gender: ENUM  phoneNumbr: String  dateOfBirth: Date |
| +getFirstName():String  +setFirstName(firstName:String)  +getLastName():String  +setLastName(lastName:String)  +setGender(gender:Gender)  +getGender():ENUM  +getPhoneNumber():String  +setPhoneNumbr(phoneNumber:String)  +getDateOfBirth():Date  +setDateOfBirth (dateOfBirth:String) |

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| **Gender** |
| male=1  female=2 |

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| **Customer** |
| emailAddress: String  billingAddress: String |
| +getEmailAddress():String  +setEmailAddress(emailAddress:String)  +getBillingAddress():String  +setBillingAddress(billingAddress:String) |

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| **Customer1: Customer** |
| firstName: “James”  lastName: “W. Jones”  gender: Gender.Male  phoneNumbr: 816-897-9862  dateOfBirth: [1996-6-6]  emailAddress: “Jamesjones@gmail.com”  billingAddress: “Dubai” |

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| **Cashier** |
| employeeIDNumber: Integer  registerNumber: Integer  managerName: String |
| +getEmployeeIdNumber():Integer  +setEmployeeIdNumber(employeeIdNumber:Integer)  +getRegisterNumber ():Integer  +setRegisterNumber (registerNumber:Integer)  +getManagerName():String  +setManagerName(ManagerName:String) |

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| **Cashier1: Cashier** |
| firstName: “John”  lastName: “Smith”  gender: Gender.Male  employeeIDNumber: 01234  registerNumber: 56789  managerName: “Tim A.” |

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| **Mechanic** |
| areasOfExpertise: String  yearsOfExperience: Integer |
| +getAreasOfExpertise():String  +setAreasOfExpertise(areasOfExpertise:String)  +getYearsOfExperience():Integer  +setYearsOfExperience(yearsOfExperience :Integer) |

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| **Mechanic1: Mechanic** |
| firstName: “Hans”  lastName: “K”  gender: Gender.Male  areasOfExpertise: “Repair”  Years of experience: 10 |

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| **Vehicle** |
| make: ENUM  model: ENUM  year: Integer  color: ENUM  vehicleId: String |
| +getMake():ENUM  +setMake(make:ENUM)  +getModel():ENUM  +setModel(model:ENUM)  +getYear():Integer  +setYear(year:Integer)  +getColor():ENUM  +setColor(color:ENUM)  +getVehicleId():String  +setVehicleId(vehicleId:String) |

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| **Make** |
| Nissan=1  Toyota=2 |

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| **Model** |
| Altima=1  Camry=2 |

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| **Color** |
| Silver=1  White=2 |

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| **Vehicle1: Vehicle** |
| make: Make.Nissan  model: Model.Altima  year: 2014  color: Color.Silver  vehicleId: “AD-89034” |

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| **Service** |
| serviceName: ENUM  servicePrice: Integer  mechanicName: String  serviceStatus: ENUM |
| +getServiceName():ENUM  +setServiceName(serviceName:ENUM)  +getServicePrice():Integer  +setServicePrice(servicePrice:Integer)  +getMechanicName():String  +setMechanicName(mechanicName:String)  +getServiceStatus():ENUM  +setServiceStatus(serviceStatus :ENUM) |

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| **ServiceName** |
| Diagnostics=1  OilReplacement=2  OilFilterParts=3  TireReplacement=4  Tire=5 |

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| **ServiceStatus** |
| Pending=1  In progress=2  Complete=3 |

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| **Service1: Service** |
| vehicleId: “AD-89034”  serviceName: ServiceName.Diagnostics  servicePrice: 15  mechanicName: “Hans K.”  serviceStatus: ServiceStatus.Complete |

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| **Service2: Service** |
| vehicleId: “AD-89034”  serviceName: ServiceName.OilReplacement  servicePrice: 120  mechanicName: “Hans K.”  serviceStatus: ServiceStatus.Complete |

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| **Service3: Service** |
| vehicleId: “AD-89034”  serviceName: ServiceName.OilFilterParts  servicePrice: 35  mechanicName: “Hans K.”  serviceStatus: ServiceStatus.Complete |

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| **Service4: Service** |
| vehicleId: “AD-89034”  serviceName: ServiceName.TireReplacement  servicePrice: 100  mechanicName: “Hans K.”  serviceStatus: ServiceStatus.Complete |

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| **Service5: Service** |
| vehicleId: “AD-89034”  serviceName: ServiceName.Tire  servicePrice: 160  mechanicName: “Hans K.”  serviceStatus: ServiceStatus.Complete |

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| **Receipt** |
| cashierName: String  date: Date  totalServices: Integer  taxes: Float  discount: Float  totalCost: Integer |
| +getCashierName():String  +setCashierName(cashierName:String)  +getDate():Date  +setDate(date:Date)  +getTotalServices():Integer  +setTotalServices(totalServices:Integer)  +getTaxes():Float  +setTaxes(taxes:Float)  +getDiscount():Float  +setDiscount(discount:Float)  +getTotalCost():Integer  +setTotalCost(totalCost:Integer) |

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| **Receipt1: Receipt** |
| Cashier name: “John Smith”  Date: [3- 13-2022]  Total services: 5  Taxes: 21.5  Discount: 11.5  Total cost: 440 |

Relationships:

Person is a superclass of Customer, Cashier, and Mechanic classes. Each of these classes has additional attributes and methods specific to their roles.

Vehicle is associated with Service as each service is performed on a specific vehicle.