

## **ENPM808X: Software Development for Robotics**

**Mohammed Maaruf Vazifdar | UID: 11759717**

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### **Software Engineering 3.13**

*Q: What is inheritance in object-oriented technology? Give an example.*

Inheritance is the relation in which the child classes derive the attributes and members from the parent class.

Ex:

```
class Vehicle
{
    private:
        string Colour;
        int NoOfWheels;
};
class Car: public Vehicle
{
    private:
        string Model;
        string OwnerName;
        int RegistrationNo;
    public:
        CarDetails(int RegistrationNo);
};
```

Here class Car derives the attributes colour and NoOfWheels from the parent class Vehicle.

### **Software Engineering 3.14**

*Q: What is the difference between an object and a class in OO technology?*

A class is a blueprint or template that helps bind attributes and members together whereas an object is an instance or a variable of that type of class.

### **Software Engineering 3.15**

*Q: Describe the role of polymorphism in object-oriented technology. Give an example.*

Polymorphism allows objects or functions to act differently depending on how they are called.

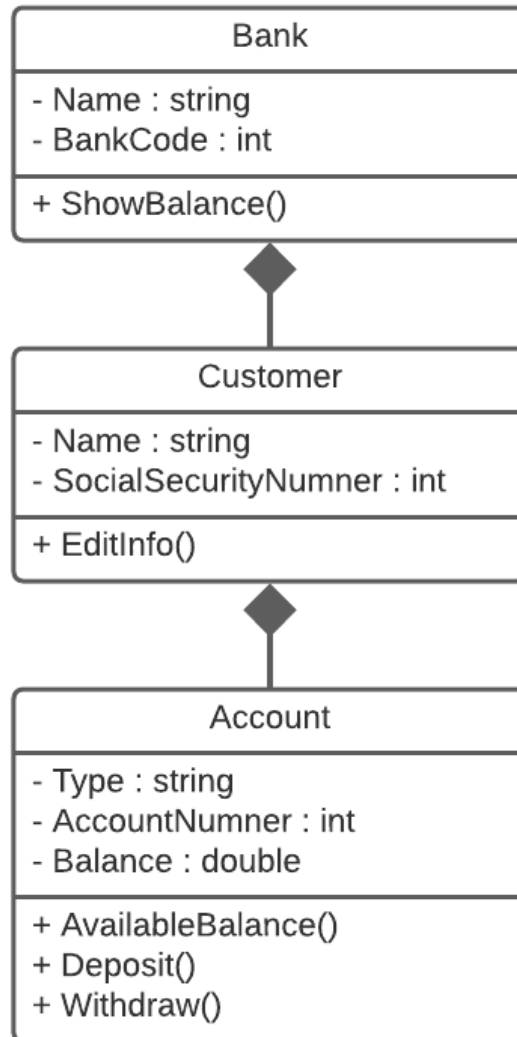
Ex:

```
void Print(string MyString)
{
    std::cout<<MyString;
}
void Print(int MyArray[])
{
    for(int i=0 ; i<MyArray.size() , i++)
    {
        std::cout<<MyArray[i]<<" , ";
    }
}
int main()
{
    Print({1,2,3,4,5});
    Print("Hey I am Maaruf");
    return 0;
}
```

### Software Engineering 4.1

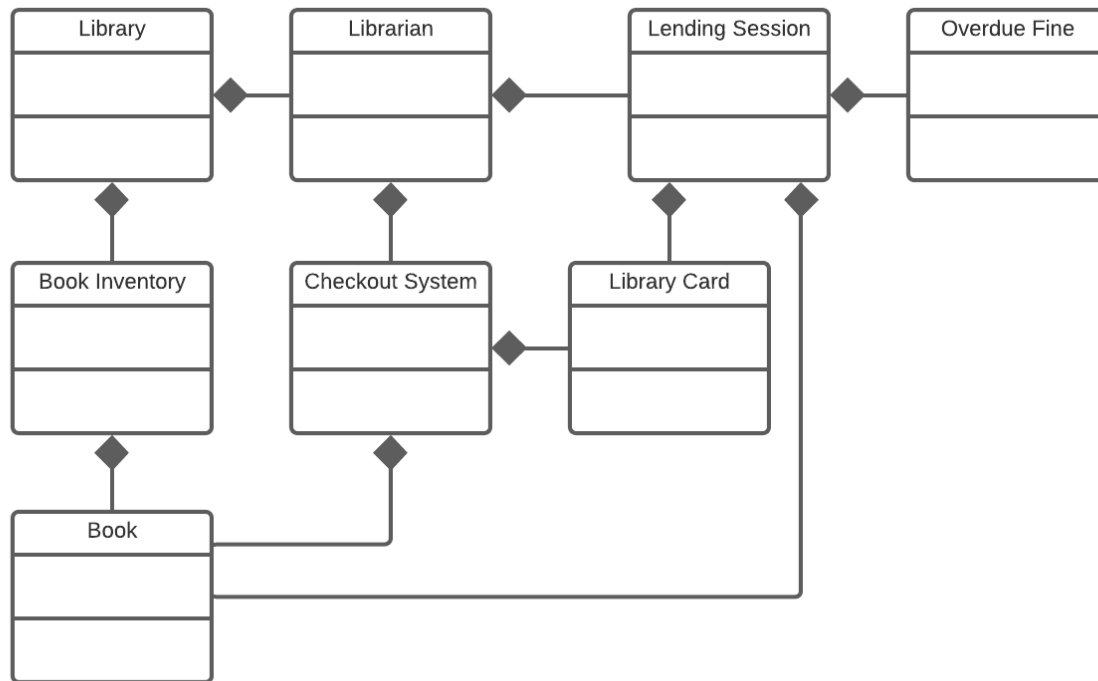
Q: Draw a class diagram of a small banking system showing the associations between three classes: the bank, customer, and the account.

#### UML Class Diagram



## Software Engineering 4.2

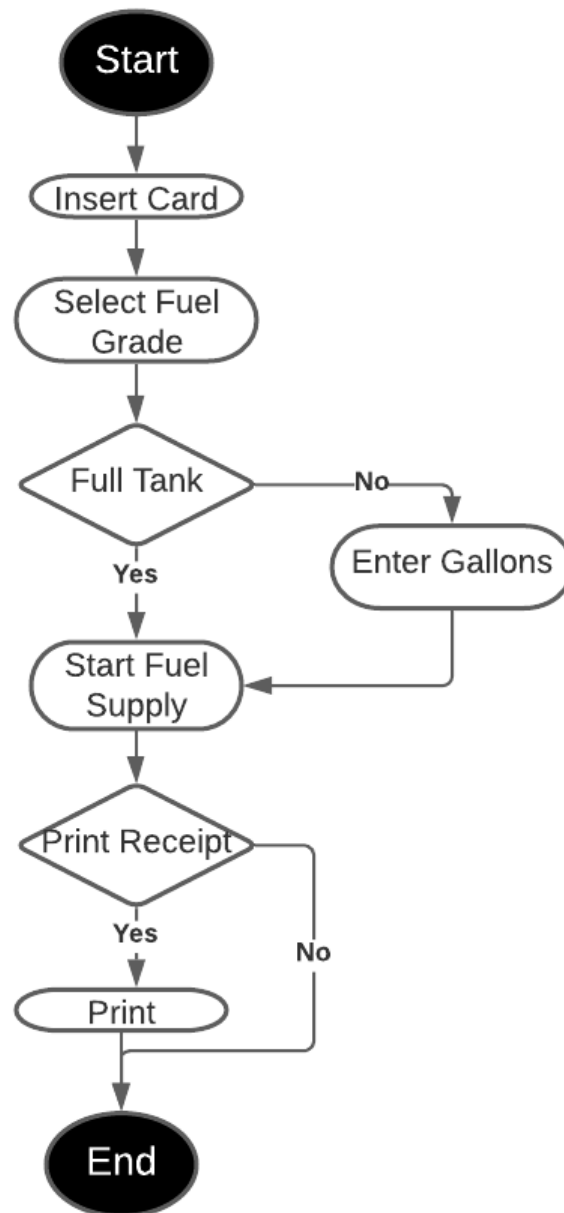
Q: Draw a class diagram of a library lending books using the following classes: Librarian, Lending Session, Overdue Fine, Book Inventory, Book, Library, Checkout System, and Library Card.



1. **Library**: Holds information about the library like name, address. Parent Class.
2. **Librarian**: Holds information about the librarian, his/her roles. Subset of Library.
3. **Lending Session**: Holds information about the lending system. Subset of Librarian
4. **Overdue Fine**: Holds fine information, members to calculate overdue fine. Subset of Lending Session
5. **Book Inventory**: Holds information of all the books like name, shelf number etc. Subset of Library.
6. **Book**: Holds specific information of each book in the library. Subset of Book Inventory.
7. **Checkout System**: Holds Information of books being lent, returned, member to manage checkout information for each user. Subset of Librarian.
8. **Library Card**: Holds information about the card holder, his/her issued books. Depends on Checkout System and Lending Session.

### Software Engineering 4.3

Q: Draw an activity diagram of pumping gas and paying by credit card at the pump. Include at least five activities, such as "Select fuel grade" and at least two decisions, such as "Get receipt?"



### **Software Engineering 4.5**

*Q: Explain how a class dependency graph differs from a UML class diagram.*

- UML class diagrams are more popular even though they are less accurate in some cases compared to class dependency graphs.
- UML class diagrams establish part-of and is-a relationship between classes whereas class dependency graphs establish supplier-client relationship.