

# **Advanced Programming**

## **Object-Oriented Programming in Java**

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**Fall 2025**





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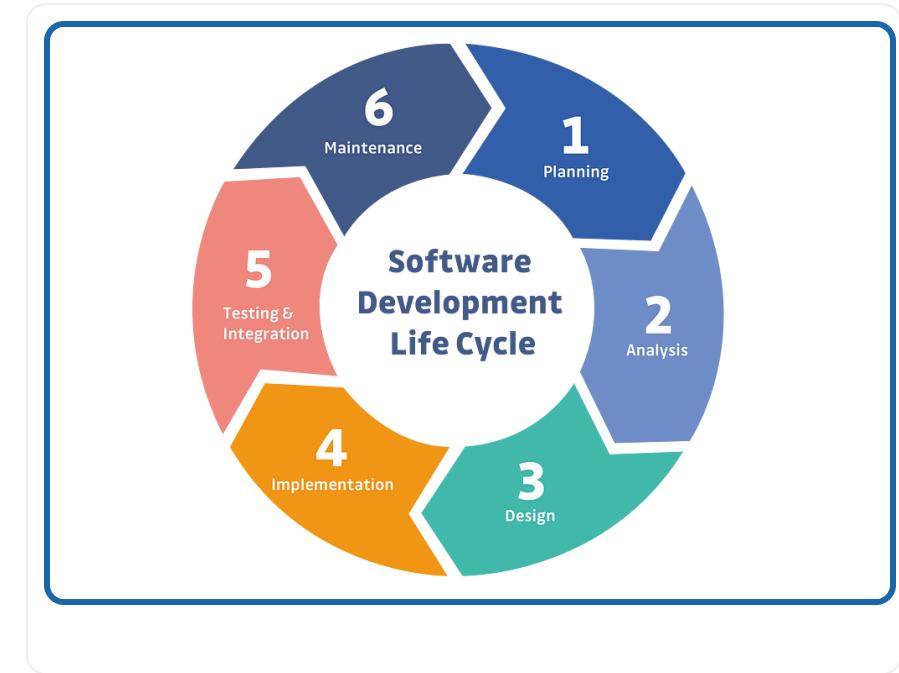
# SDLC — Software Development Life Cycle

- SDLC defines structured steps for building software.
- Common phases:
  - i. Requirement Analysis
  - ii. Design
  - iii. Implementation (Coding)
  - iv. Testing
  - v. Deployment
  - vi. Maintenance





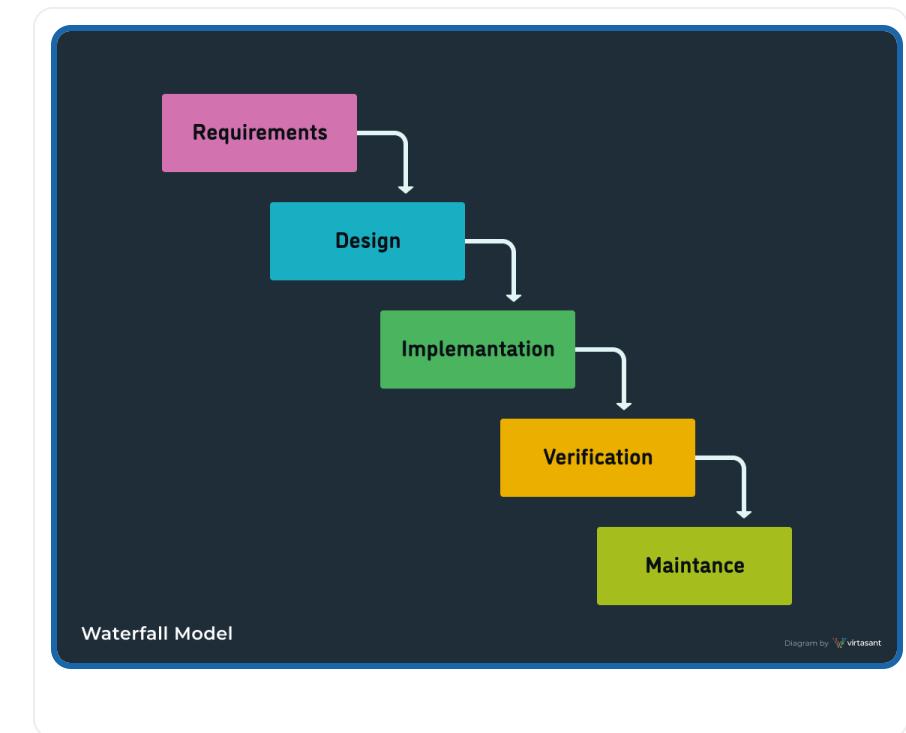
- Ensures:
  - Predictable delivery
  - Quality assurance
  - Cost & time control





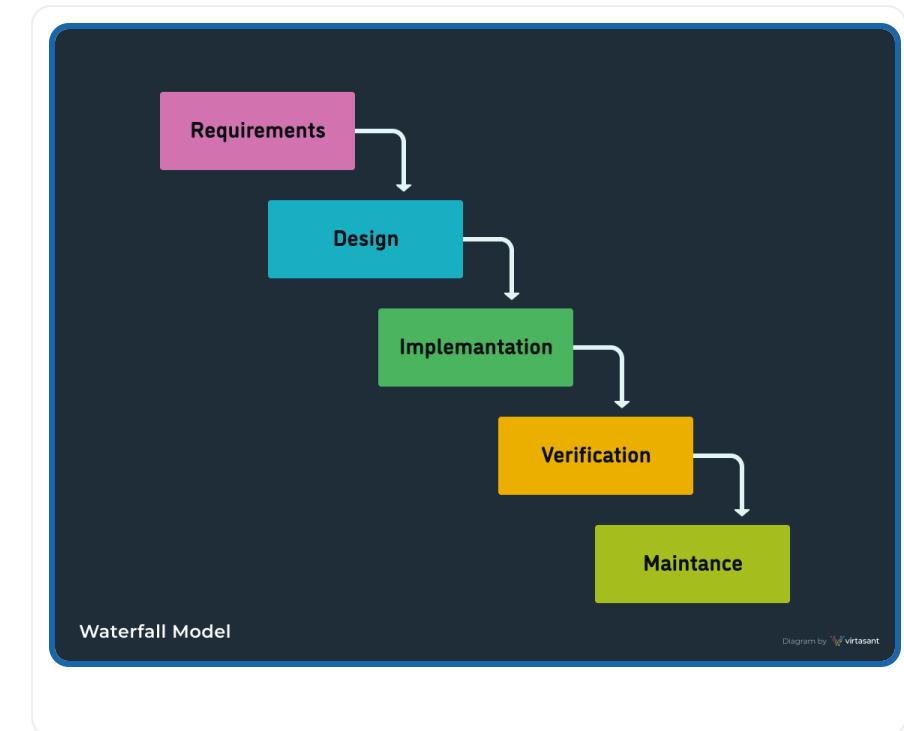
# SSDLC — Secure Software Development Life Cycle

- SSDLC = SDLC + integrated security at every stage.
- Adds security practices such as:
  - Threat modeling
  - Secure coding guidelines
  - Security testing & auditing
  - Vulnerability management





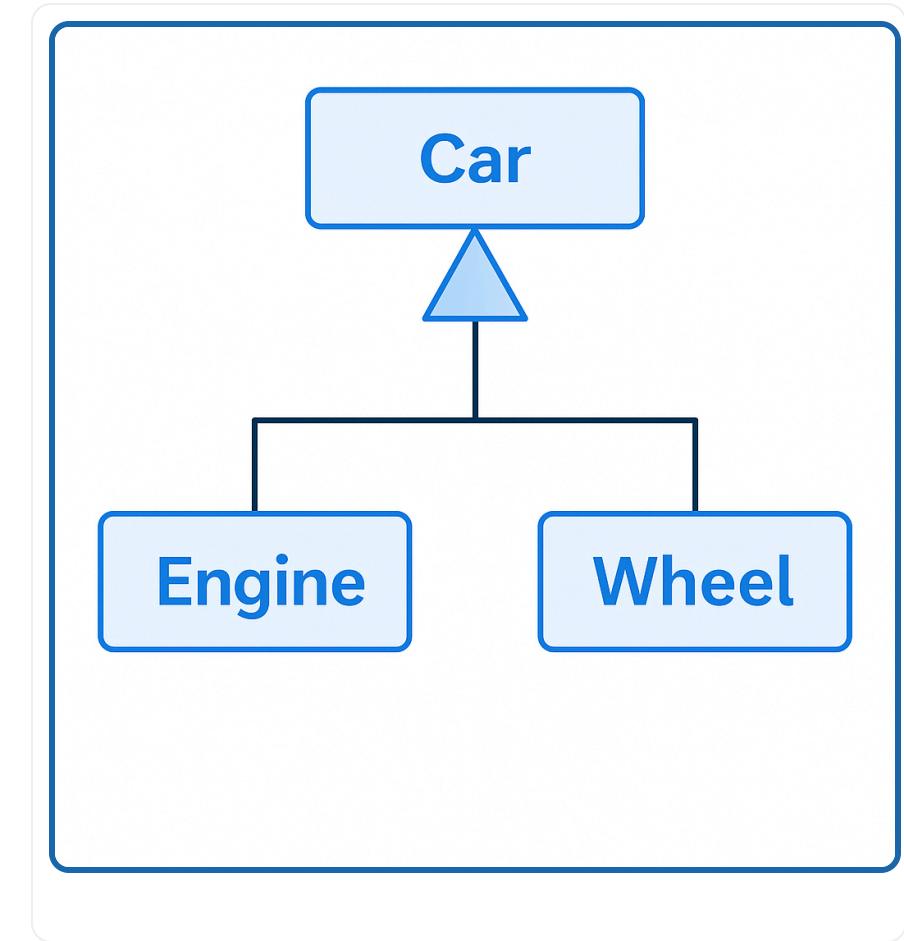
- Goal: build software that is **secure by design**.
- Common frameworks:
  - Microsoft SDL
  - OWASP SAMM
  - NIST SSDF





# UML Diagrams

- Visualize system structure.
- Relationships:
  - Association ( $\rightarrow$ )
  - Inheritance ( $\triangleright$ )
  - Composition / Aggregation ( $\diamond$ )





# Creating a Class in Java

```
public class Car {  
    String color;  
  
    void drive() {  
        System.out.println("Driving");  
    }  
}  
  
Car c = new Car();  
c.  
  
drive();
```

## Creating a Class in Java

```
public class Car {  
    String color;  
    void drive() {  
        System.out.println  
            "Driving";  
    }  
}  
Car c = neew Car();  
c.drive();
```

Console  
Driving

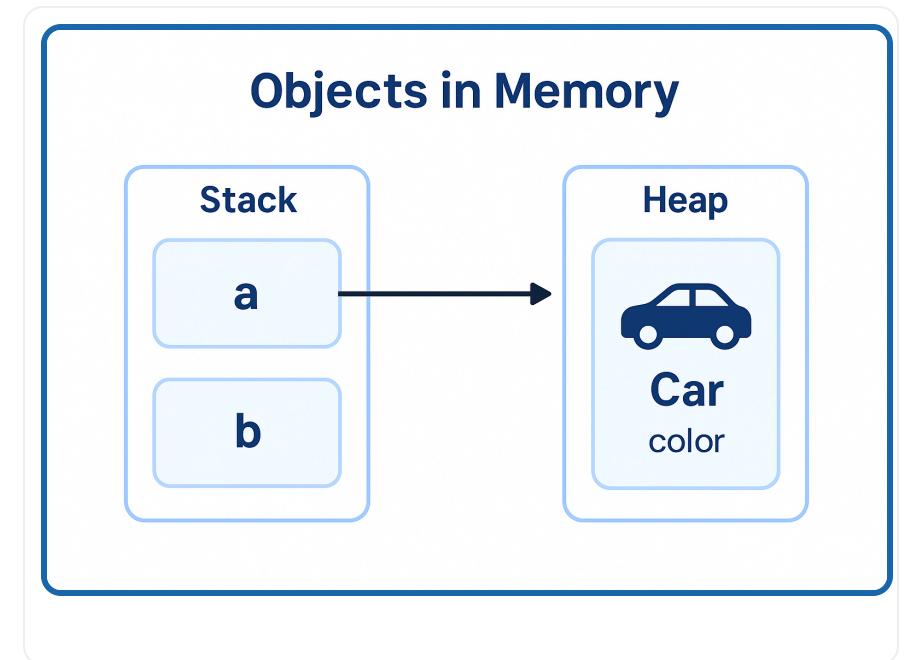


# Objects in Memory

- Objects live in **Heap**, references on **Stack**.
- Example:

```
Car a = new Car();  
Car b = a;
```

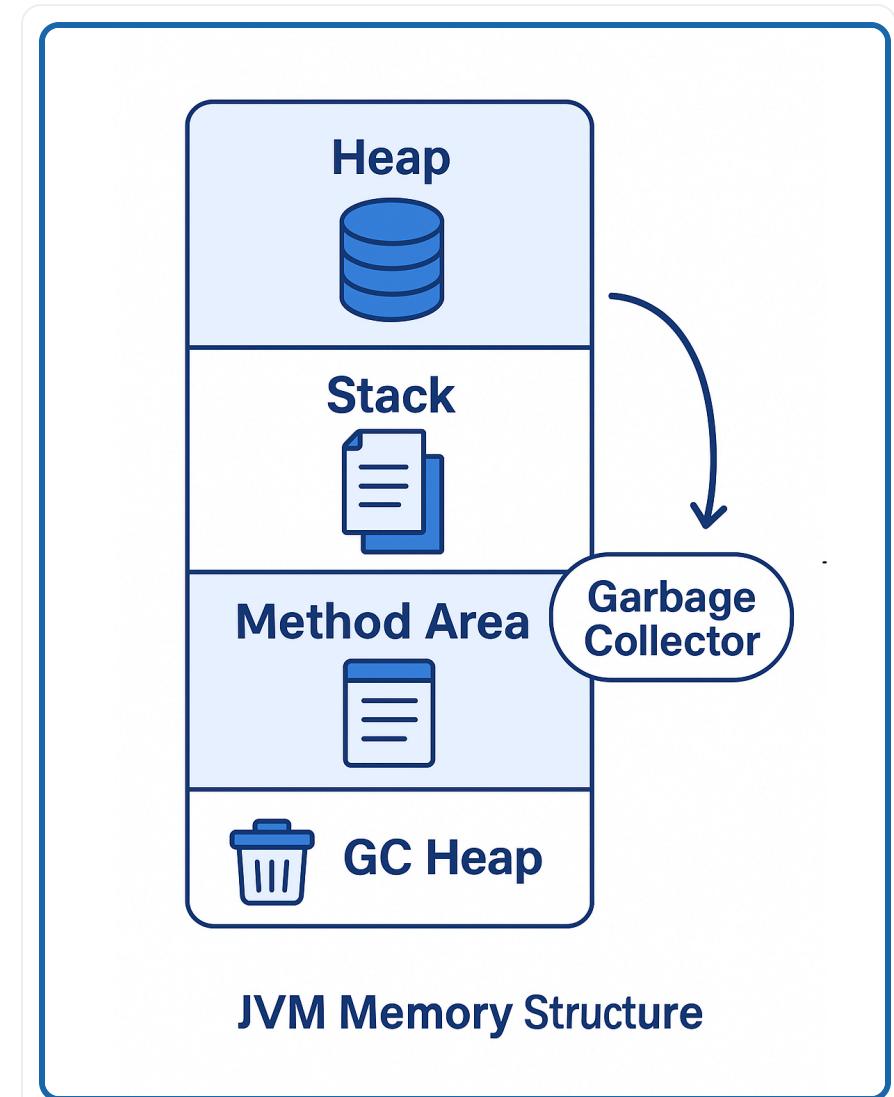
→ both point to the same object.





# Java Memory Management

- Heap → objects
- Stack → local vars
- GC → automatic cleanup
- JVM manages lifecycle



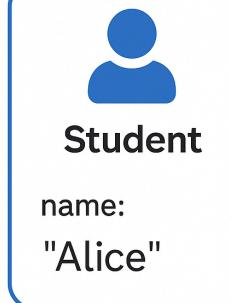


# Constructors and this Keyword

```
class Student {  
    String name;  
  
    Student(String name) {  
        this.name = name;  
    }  
}
```

```
class Student {  
    String name;  
    Student(String name)  
        this.name = name;  
}
```

this



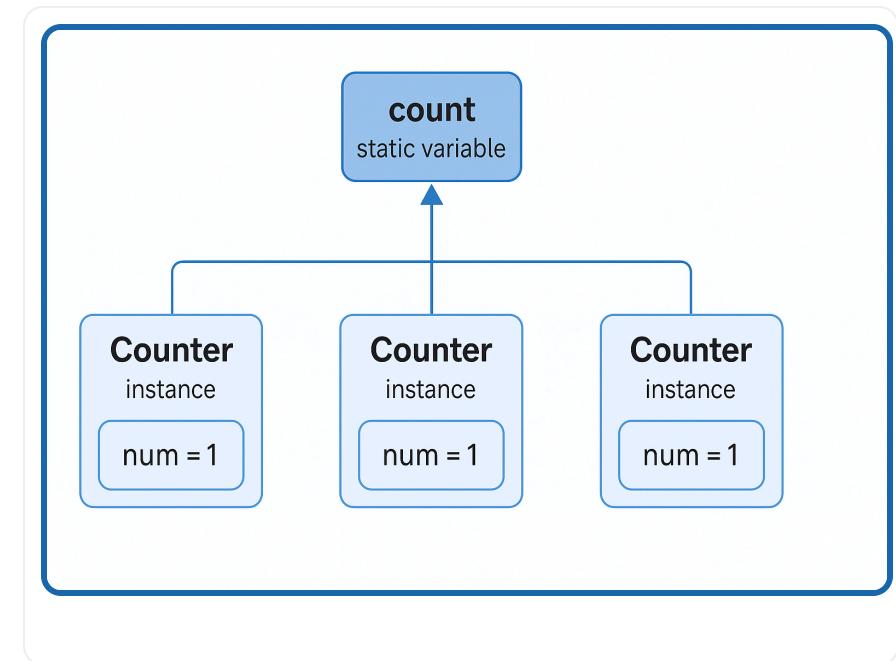
- Called automatically at object creation.
- `this` → current object reference.



# static Keyword

- Belongs to the **class**, not objects.
- Shared between all instances.

```
class Counter {  
    static int count = 0;  
    Counter() { count++; }  
}
```

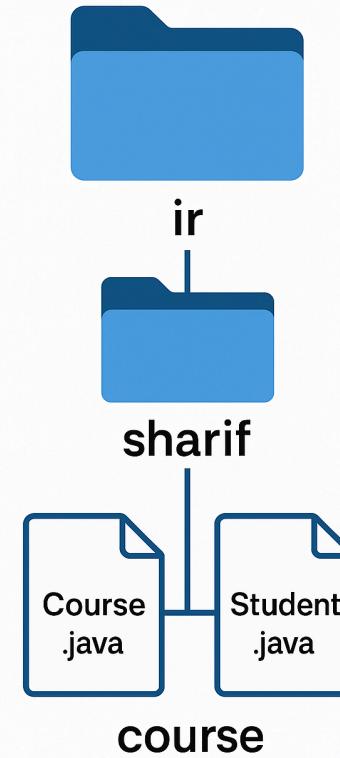




# Packaging in Java

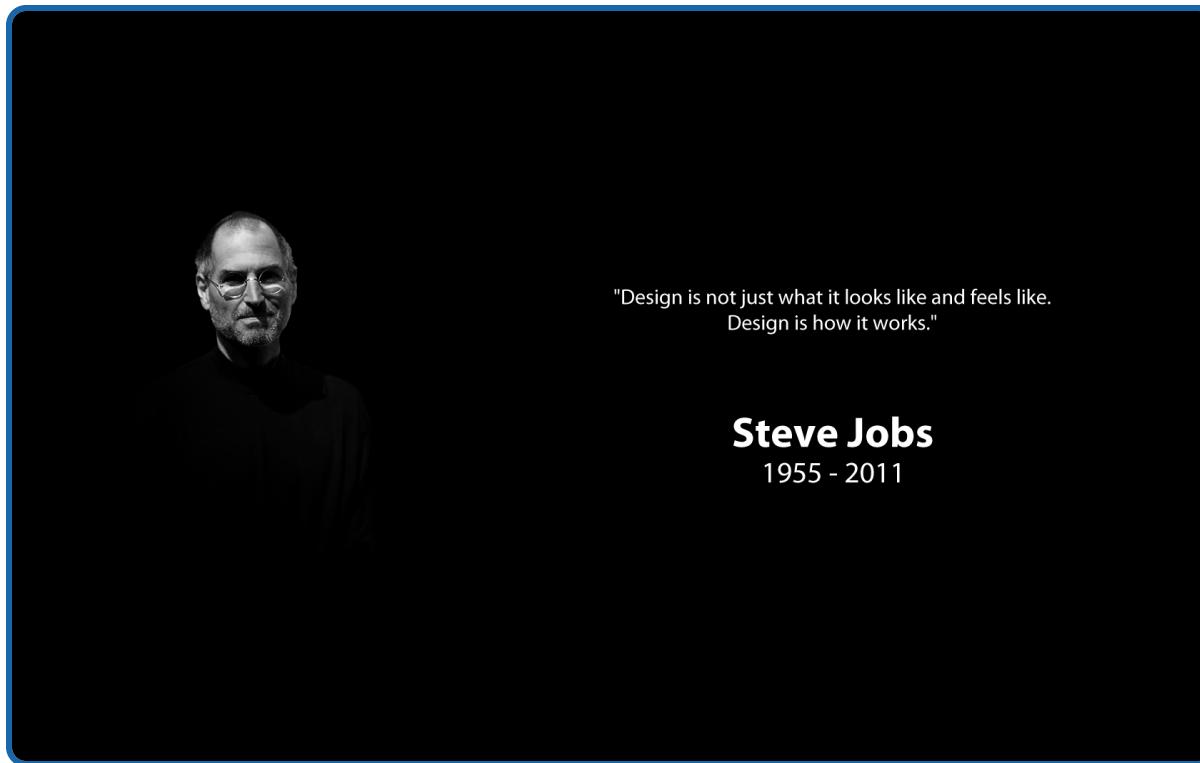
```
package ir.sharif.course;  
  
import java.util.*;
```

- Groups related classes.
- Prevents naming conflicts.



# Thank You

AP — OOP in Java



"Design is not just what it looks like and feels like.  
Design is how it works."

**Steve Jobs**  
1955 - 2011