SNS COLLEGE OF ENGINEERING

Kurumbapalayam (Po), Coimbatore – 641 107

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DEPARTMENT OF ARTIFICIAL INTELLIGENCE AND DATA SCIENCE

COURSE NAME : 23CSB101- OBJECT ORIENTED PROGRAMMING

I YEAR /II SEMESTER

Unit I – INTRODUCTION TO OOP AND JAVA

Topic : Overview of OOP

Topics to be covered

- Overview of OOP
- Object oriented programming paradigms
- Features of Object Oriented Programming
- Java Buzzwords

Overview of OOP

- OOP stands for **Object-Oriented Programming**.
- OOP is faster and easier to execute
- OOP provides a clear structure for the programs
- OOP helps to keep the Java code DRY "Don't Repeat Yourself", and makes the code easier to maintain, modify and debug
- OOP makes it possible to create full reusable applications with less code and shorter development time
- Classes and objects are the two main aspects of object-oriented programming.

Object oriented programming paradigms

- A **programming paradigm** is a relatively high-level way to conceptualize and structure the implementation of a computer program. A programming language can be classified as supporting one or more paradigms
- Object-oriented programming (OOP) is a programming paradigm based on the concept of objects, which can contain data and code: data in the form of fields (often known as attributes or properties), and code in the form of procedures (often known as methods). In OOP, computer programs are designed by making them out of objects that interact with one another.
- Many of the most widely used programming languages (such as C++, Java, and Python) are multi-paradigm and support object-oriented programming to a greater or lesser degree, typically in combination with imperative programming and declarative programming.

Object and Procedural oriented Programming

Procedural Oriented Programming	Object-Oriented Programming
In procedural programming, the program is divided into small parts called ***functions***.	In object-oriented programming, the program is divided into small parts called ***objects***.
Procedural programming follows a ***top-down approach***.	Object-oriented programming follows a ***bottom-up approach***.
There is no access specifier in procedural programming.	Object-oriented programming has access specifiers like private, public, protected, etc.
Adding new data and functions is not easy.	Adding new data and function is easy.
Procedural programming does not have any proper way of hiding data so it is ***less secure***.	Object-oriented programming provides data hiding so it is ***more secure***.
In procedural programming, overloading is not possible.	Overloading is possible in object-oriented programming.
In procedural programming, there is no concept of data hiding and inheritance.	In object-oriented programming, the concept of data hiding and inheritance is used.
In procedural programming, the function is more important than the data.	In object-oriented programming, data is more important than function.
Procedural programming is based on the ***unreal world***.	Object-oriented programming is based on the ***real world***.
Procedural programming is used for designing medium-sized programs.	Object-oriented programming is used for designing large and complex programs.
Procedural programming uses the concept of procedure abstraction.	Object-oriented programming uses the concept of data abstraction.
Code reusability absent in procedural programming,	Code reusability present in object-oriented programming.
Examples: C, FORTRAN, Pascal, Basic, etc.	**Examples:** C++, Java, Python, C#, etc.

Object oriented Programming Concepts

Feature	Description
Abstraction	: Hides the implementation details of sophisticated methods, allowing users to see only the necessary information
Polymorphism	: The ability of an object to behave differently depending on the context
Inheritance	: The ability of a class to inherit properties and characteristics from another class
Encapsulation	: Allows reuse of functionality without compromising security

Concepts define how OOP functions, while **features** describe the benefits and characteristics that OOP provides.

Object oriented Programming Features

Feature	Description
Abstraction	: Hides the implementation details of sophisticated methods, allowing users to see only the necessary information
Polymorphism	: The ability of an object to behave differently depending on the context
Inheritance	: The ability of a class to inherit properties and characteristics from another class
Encapsulation	: Wrapping data and methods together to restrict direct access and protect the integrity of an object.
Class	: A user-defined data type that acts as a blueprint for creating objects
Object	: An instance of a class that contains an address and takes up space in memory
Aggregation	: A specialized form of association between two or more objects, where each object has its own life cycle

Features of Object oriented Programming

1. Encapsulation – Wrapping data and methods together to restrict direct access and protect the integrity of an object.
2. Abstraction – Hiding complex implementation details and exposing only the necessary functionalities to the user.
3. Inheritance – Enabling one class to inherit properties and behaviors from another, promoting code reusability.
4. Polymorphism – Allowing methods to have different implementations based on the object that invokes them, enhancing flexibility.

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Features of Object oriented Programming

5. Class & Object – A class is a blueprint for creating objects, and an object is an instance of a class with specific attributes and behaviors.
6. Dynamic Binding – Deciding which method to invoke at runtime rather than compile-time, allowing more flexibility in code execution.
7. Message Passing – Objects communicate with each other by sending and receiving data through method calls, enabling modular and interactive programming.

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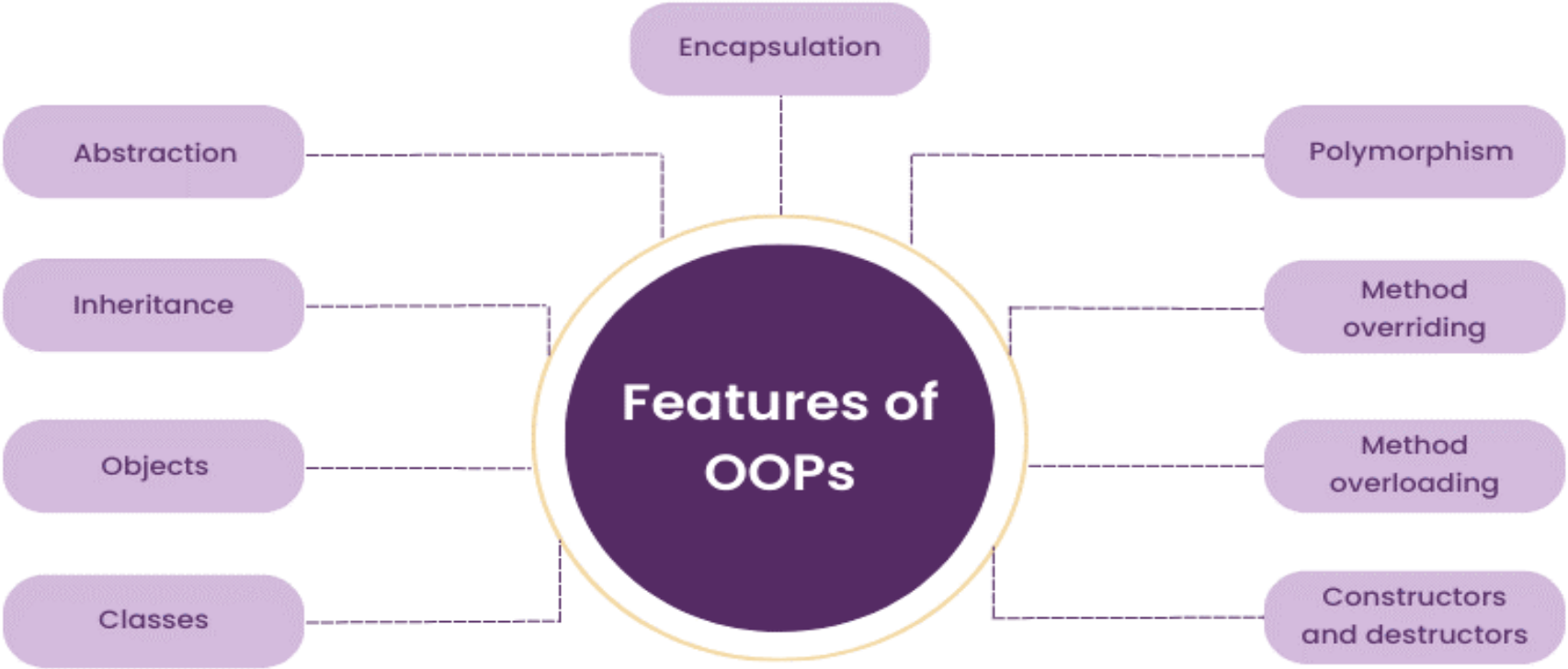
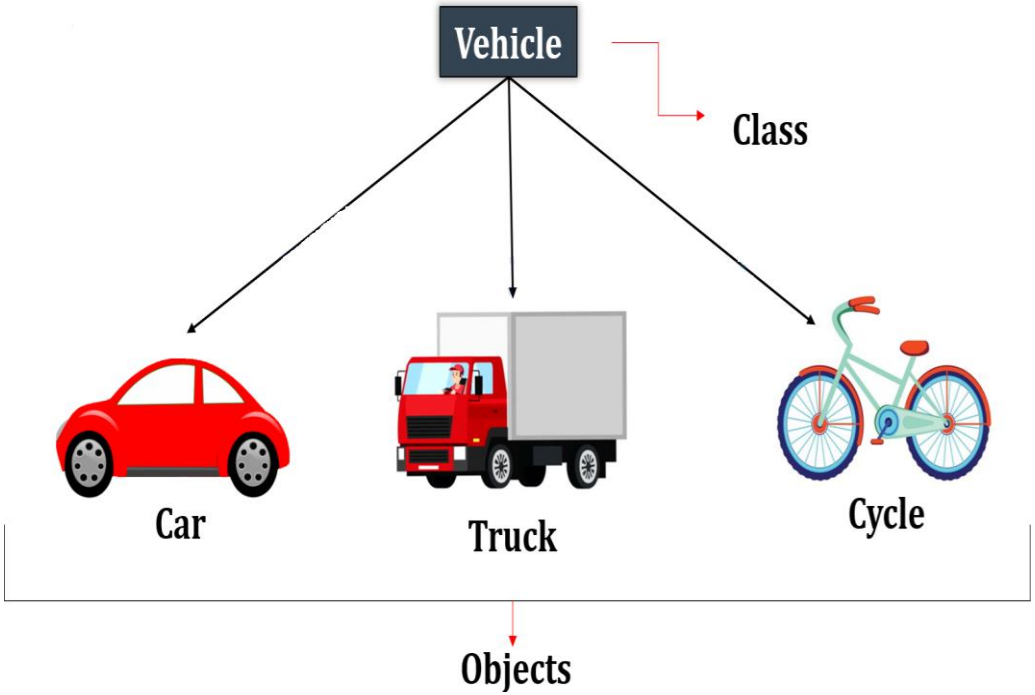
Features of Object oriented Programming

8. **Modularity** – The division of a program into smaller, independent, and reusable modules that enhance maintainability and scalability.
9. **Reusability** – Using existing code (through inheritance and modularity) to reduce redundancy and improve efficiency.
10. **Scalability** – OOP supports building large and complex systems by organizing code into reusable objects and classes.

Features of OOPs



Class and Objects



- a class is a template for objects, and an object is an instance of a class.
- When the individual objects are created, they inherit all the variables and methods from the class.

Java Buzzwords

Factors that played an important role in molding the final form of the language were summed up by the Java team as buzzwords. These define the characteristics that make Java a powerful and widely used programming language.

1. Simple – Java is designed to be easy to learn and use, with a clean syntax similar to C++.

2. Object-Oriented – Java follows the OOP paradigm, focusing on objects and classes for better modularity and reusability.

3. Portable – Java programs can run on any platform with a Java Virtual Machine (JVM), making it platform-independent.

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Java Buzzwords

4. Platform-Independent – Java follows the "Write Once, Run Anywhere" (WORA) principle, meaning code compiled on one machine can run on another without modification.

5. Secure – Java has built-in security features like bytecode verification, exception handling, and a robust security manager to prevent vulnerabilities.

6. Robust – Java handles memory management automatically (Garbage Collection) and has strong exception-handling mechanisms, making it reliable.

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Java Buzzwords

7. Multithreaded – Java supports multithreading, allowing multiple tasks to run simultaneously, improving performance.

8. Architecture-Neutral – Java is designed to work on different hardware architectures without modification.

9. Distributed – Java provides features like Remote Method Invocation (RMI) and networking support for building distributed applications.

10. Dynamic – Java supports dynamic loading of classes, meaning new code can be added and executed at runtime without affecting existing code.

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Java Buzzwords

11. High Performance – While Java is interpreted, Just-In-Time (JIT) compilation improves execution speed by converting bytecode into native code at runtime.

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Summary

- OOP- Object Oriented Programming - helps to keep the Java code DRY "Don't Repeat Yourself", and makes the code easier to maintain, modify and debug
- Object-oriented programming (OOP) is a programming paradigm based on the concept of objects, which can contain data and code
- Features of Object Oriented Programming – **Encapsulation**, **Abstraction**, **Inheritance**, **Polymorphism**, Class and Object, Dynamic Binding, Message Passing, Modularity, Reusability, and Scalability.

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Summary

Java Buzzwords -

- Simple • Secure • Portable • Object-oriented
- Robust • Multithreaded • Architecture-neutral
- Interpreted • High performance • Distributed • Dynamic


Thank
you