Computer Programming: JAVA

Premanand S

Assistant Professor
School of Electronics Engineering
Vellore Institute of Technology
Chennai Campus *premanand.s@vit.ac.in*

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- No Phone
- Notebook
- Attendance mandatory 75% (Both Theory and Lab)

Course inforamtion

- Subject Name: Computer Programming: JAVA
- Subject Code: BCSE103E
- Class ID: CH2024250501488
- Slot: TB2, L3+L4+L13+L14
- Credit: 2+1

Module 1: JAVA Basics

- OOP Paradigm
- Features of JAVA Language
- JVM
- Bytecode
- Java Program Structure
- Basic Programming Construct
- Data Types
- Variables
- Java naming conventions
- Operators

Module 2: Looping Constructs and Arrays

- Control looping and Constructs
- Arrays
- One-dimensional
- Multi-dimensional
- Enhanced for loop
- Strings
- Wrapper classes

Module 3: Classes and Objects

- Class Fundamentals
- Access and Non-access Specifiers
- Declaring Objects and assigning object reference variables
- Array of objects
- Constructor and Destructors
- usage of 'this' and 'static' keywords

Module 4: Inheritance and Polymorphism

- Inheritance
- Types
- use of 'super'
- final keyword
- Polymorphism
- Overloading and Overriding
- Abstract class
- Interfaces

Module 5: Packages and Exception Handling

- Packages: Creating and Accessing
- Sub-packages
- Exception Handling
- Types of Exception
- Control flow in exception
- Use of try, catch, finally, throw, throws in exception handling
- User-defined exception

Module 6: IO Streams and Files

- JAVA IO Streams
- FileInputStream and FileOutputStream
- FileReader and FileWriter
- DataInputStream and DataOutputStream
- BufferedInputStream and BufferedOutputStream
- PrintOutputStream
- Serialization and De-serialization

Module 7: Collection Framework

- Generic classes and methods
- Collection framework:List and Map

Some important instructions,

- Theory Attendance is mandatory for the Computer Programming : JAVA (BCSE103E) course. If someone is debarred in theory, debarred student's grade will be 'F' in both Theory and Lab.
- 6 components for evaluation process, PAT1, PAT2, PAT3, PAT4, PAT5 and PAT6 (60 marks), we have 2FATs (40 marks)
- As there is no option for Re-Test, students should be aware of their schedules well in Advance.
- No boosting of marks is possible as evaluation is based on the IamNeoPortal. Ensure students are aware of this and everything transparent to them.

IamNeoPortal

- Student link portal

Why Programming is Essential in Electronics Engineering

- **Embedded Systems Development:** Programming microcontrollers, microprocessors, and SoCs using languages like C, C++, and Python.
- **Circuit Design and Simulation:** Writing scripts for analog and digital circuit simulation using MATLAB, Proteus, and Multisim.
- **Automation and Control Systems:** Automating industrial processes and robotics using Arduino, Raspberry Pi, and PLC systems.
- **Signal and Image Processing:** Processing signals and images using MATLAB, Python, and custom libraries.
- **Software Development for Tools:** Developing testing and debugging tools with Java, Python, and C.
- **Hardware-Software Integration:** Creating firmware and drivers for hardware in C and Assembly.
- **Data Analysis and Visualization:** Analyzing sensor data using MATLAB and Python Pandas.
- **Research and Development:** Innovating in AI-powered devices, smart electronics, and wearable tech.

Why JAVA language

- 90% of FORTUNE companies
- Tech giants (Amazon, Google, Microsoft), Financial (J.P.Morgan Chase, Goldman Sachs, Citi Bank), E-Commerce (Flipkart, Ebay, Walmart), Social Media (LinkedIN, Spotify, Netflix), IT firms (IBM, Oracle, TCS, Infosys, Wipro, Capegemini, Accenture, Oracle) and Travels (AirBnB, Uber and Booking.com) many more...
- 25+ years old language
- Full stack developer, Backend developer
- Security concern - banking sector

Differences Between Java and Python

Aspect	Java	Python
Syntax	Strict, verbose (curly braces, semicolons)	Simple, readable (indentation-based)
Execution	Compiled (JVM Bytecode)	Interpreted (Python Interpreter)
Platform Dependency	Platform-independent via JVM	Platform-independent via Interpreter
Performance	Faster due to compiled nature	Slower due to interpretation
Learning Curve	Steeper due to strict syntax	Easier due to simple syntax
Best Use Cases	Enterprise apps, Android development	AI, Data Science, Web Development

Similarities Between Java and Python

Aspect	Similar Feature
Object-Oriented	Both support object-oriented programming
Cross-Platform	Both are platform-independent
Memory Management	Automatic memory management (Garbage collection)
Library Support	Extensive standard and third-party libraries
Community Support	Large developer communities and forums
Multithreading	Both support multithreading for concurrent tasks

Python in Electronics Engineering

Area	How Python Helps
Embedded Systems	Microcontroller programming using libraries like MicroPython.
Data Analysis	Processing sensor data with NumPy, Pandas, and Matplotlib.
Machine Learning	AI applications like signal processing using TensorFlow.
IoT Development	Connecting devices using frameworks like Flask and MQTT.
Simulation Tools	Simulation of circuits using PySpice or SimPy.
Image/Signal Processing	Digital signal and image processing with libraries like OpenCV, SciPy, and Librosa.

Java in Electronics Engineering (Part 1)

Domain	How Java Helps
Embedded System Simulators	Simulation of electronics devices using Java-based tools like Multi-Sim and Proteus.
Industrial Automation	Controlling robotic arms, conveyor systems, and industrial devices using Java frameworks like JavaFX and MQTT.
SCADA Systems	Supervisory Control and Data Acquisition (SCADA) applications for remote monitoring.
IoT Middleware Development	Developing cloud-based services and APIs to connect IoT devices securely using Java frameworks like Spring Boot.

Java in Electronics Engineering (Part 2)

Domain	How Java Helps
Simulation and Modeling	Electrical circuit simulators using Java-based tools like SimJava for system-level modeling.
Smart Grid Applications	Energy management and grid monitoring using Java enterprise applications.
Signal Processing Tools	Implementing custom signal processing algorithms using Java libraries like JSignalWorkbench.
Digital Twin Implementation	Simulating real-time replicas of electronic devices and components for research and testing using Java.

Java in Electronics Engineering (Part 3)

Domain	How Java Helps
Mobile App Development	Android development for controlling hardware through mobile apps.
Software Development	Building control interfaces and GUIs for electronics systems.
Networking and Security	Secure communication for IoT and embedded systems.
Automation Tools	Creating cross-platform automation applications.

Which Language to Choose?

- **Choose Python**:
  - For embedded systems, AI, IoT, data analysis, and hardware simulations.
- **Choose Java**:
  - For Android development, enterprise software, or automation tools.
- **Best Approach**: Learn both languages to maximize career opportunities, as they complement each other in electronics and software development.

Some basic questions, before getting our hands dirty

- What is Java?
- What are the key features of Java that make it a popular programming language?
- What are some popular applications or platforms built using Java?
- In what fields or industries is Java commonly used, and what are some specific applications?
- What are the benefits of learning Java for your future career?
- Why do many developers prefer Java for large-scale applications?
- Where can you get help if you are stuck with a Java problem?
- What are the companies that use Java?

What is Java?

- Java is a high-level, object-oriented programming language developed by Sun Microsystems (now owned by Oracle). It is designed to be platform-independent, allowing applications to run on any device that has the Java Virtual Machine (JVM) installed.

What are the key features of Java?

- **Platform Independence**: Java programs can run on any platform with a JVM.
- **Object-Oriented**: It follows the object-oriented programming paradigm, making code modular and reusable.
- **Robust and Secure**: Java provides strong memory management and security features.
- **Multithreading**: It supports multithreading, allowing the execution of multiple threads simultaneously.
- **Rich API**: Java has a large set of libraries and APIs for almost all use cases.

What are some popular applications built using Java?

- **Android apps**: Java is widely used for developing Android applications.
- **Web applications**: Java powers large-scale web applications like LinkedIn, eBay, and Amazon.
- **Enterprise applications**: Java is used in enterprise-level applications such as banking software.
- **Big Data technologies**: Java is used in big data frameworks like Hadoop.

In what fields or industries is Java commonly used?

- **Web Development**: For building dynamic websites and web apps with frameworks like Spring and Java EE.
- **Mobile Development**: Java is the primary language for Android mobile applications.
- **Enterprise Solutions**: Java powers enterprise applications in finance, healthcare, and e-commerce.
- **Big Data**: Java is used in big data frameworks like Hadoop and Spark.
- **Embedded Systems**: Java is also used for embedded systems and IoT devices.

What are the benefits of learning Java?

- **Wide Job Opportunities**: Java is in demand across various industries, including web development, mobile development, and enterprise solutions.
- **Cross-Platform Compatibility**: Java allows you to develop applications that can run on any platform.
- **Strong Community Support**: Java has an active developer community offering resources, forums, and libraries.
- **High Salary Potential**: Java developers are among the highest-paid in the software development field.

Why do many developers prefer Java for large-scale applications?

- **Scalability**: Java's architecture allows easy scaling of applications.
- **Mature Ecosystem**: Java has a mature ecosystem with frameworks, libraries, and tools for complex projects.
- **Multithreading**: Java's native multithreading support is ideal for concurrent systems.
- **Performance**: Java's performance has improved over time, making it suitable for high-performance systems.

Where can you get help if you are stuck with a Java problem?

- **Stack Overflow**: A platform where developers share solutions and help each other.
- **Official Java Documentation**: The official documentation is a valuable resource for Java-related queries.
- **Java Developer Communities**: Forums like Reddit's /r/learnjava and other Java-related communities.
- **Tutorial Websites**: Websites like GeeksforGeeks, W3Schools, and Oracle tutorials.

What are the companies that use Java?

- **Google**: Uses Java in Android app development.
- **Netflix**: Uses Java for backend systems.
- **Amazon**: Java is used for enterprise applications.
- **eBay**: Uses Java for backend services.
- **LinkedIn**: Java powers backend systems for scalability.
- **Twitter**: Java supports Twitter's backend architecture.

Some popular Java programming Platforms,

- IntelliJ IDEA - A popular, feature-rich IDE for Java development.
- Eclipse - A widely used IDE for Java development with support for various plugins.
- OnlineGDB - An online Java compiler that allows for quick coding and testing.
- Programiz JAVA - An easy-to-use online compiler for Java programming.
- W3Schools JAVA - An online Java compiler with an integrated learning platform for beginners.

Checkpoints to ourself,

- PAT1 - 10 marks
- PAT2 - 10 marks
- PAT3 - 10 marks
- PAT4 - 10 marks
- PAT5 - 10 marks
- PAT6 - 10 marks
- FAT1 - 50 marks
- FAT2 - 50 marks
- FATs - 40 marks

Evaluation Portion

		Tentative Topics
Week 1	Java Basics / Introducttion	
Week 2	Java Basics / Introducttion	
Week 3	Java Basics / Introducttion	
Week 4	IamNeo Tasks	
Week 5	IamNeo Tasks	
Week 6	PAT 1	Java Basics, Variables, Data Types
Week 7	CAT I (Theory)	
Week 8	PAT 2	Loops
Week 9	PAT 3	Arrays
Week 10	PAT 4	Class, Objects, Constructors, Destructors
Week 11	IamNeo Tasks / Vibrance Week	
Week 12	PAT 5	Inheritance
Week 13	IamNeo Tasks	
Week 14	CAT II (Theory)	
Week 15	PAT 6	Polymorphism, Exception Handling, Collections
Week 16	IamNeo Tasks	
Week 17	Lab FAT - Week	
Week 18	Lab FAT - Week	

FAT 1	Java Basics, Variables, Data Types, Loops, Arrays
FAT 2	Class, Objects, Constructors, Destructors, Inheritance, Polymorphism, Exception Handling, Collections

Mail me: er.anandprem@gmail.com / premanand.s@vit.ac.in
Ring me: +91 73586 79961
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WhatsApp Channel: anandsdataX

Predicting the future isn't magic, it's artificial intelligence!