CS202: IT Workshop

Dr. Manojit Ghose
IIIT Guwahati

Warm Up Poll -1

How are you?

A. Excellent
B. OK
C. Not so good

Warm Up Poll -2

Are you able to hear me?

Rule we will follow for Codetantra

If you have a doubt,

1. **Write in public chat**
2. **I will address them during the class**
3. **If needed, I may ask you to speak**

Syllabus

CS202	IT Workshop I	1-0-3-5

Java Basic: Why Java, Basic Syntax and Semantics, Variables, Types, Expressions, Assignment statements, Conditional and Iterative Control Structures;
Object Oriented Programming with Java: objects and classes, methods and messages, abstraction and encapsulation, inheritance, Interfaces, abstract classes, polymorphism, access specifiers, static members, constructors, finalize method
Java concept: Exception handling, Threads, packages, Array and String, Handling I/O, Files, Networking
Database Programming with Java: JDBC architecture, Establishing connectivity and working with connection interface, Working with statements, Creating and executing SQL statements, Working with Result Set
JSP: java server pages (JSP); SQL basics; Use of Mysql and a web server using JSP for assignments

Texts:

Harvey Deitel, Paul Deitel: Java How to Program, 9/e, Prentice Hall India.

References:

1. The online Java tutorial http://docs.oracle.com/javase/tutorial/
2. Y. Daniel Liang: Introduction to Java Programming, 9/e, Pearson Publishing
3. Herb Schildt: Java The Complete Reference, 8/e Tata Mcgraw Hill Education

Prerequisite: CS101/110 Computer programming (lab)

What will we learn in this course?

❑ Object Oriented Programming Concepts

- Abstraction, Encapsulation, Inheritance, Polymorphism, etc.

❑ Java language

- Syntax, Variables, conditional statements, loops, etc.
- Special support in Java to handle OO features (e.g. Interface)
- Exception handling, Threading, Networking, etc.
- GUI, interacting with database, etc.

Course instructors

Instructors:

- **Dr. Manojit Ghose** (mg.cse.iiitg@gmail.com)
- Dr. Nilkanta Sahu (sahu.nilkanta@gmail.com): GG2
- Dr. Angshuman Jana (janaangshuman@gmail.com): GG4

Teaching assistants:

- Ms. Veronica Naosekpam (venaosekpam11@gmail.com): GG1
- Ms. Barnana Baruah (barnanabaruah12.13@gmail.com): GG2
- Mr. Khanjan C. Baruah (khanjan099@yahoo.com): GG3
- Mr. Mridul Haque (mridulh7@gmail.com): GG4
- Ms. Kalyani Devi (kalyanee_devi@yahoo.com): GG3, GG4

General information

Grading Policy:

- Mid and end semester
- Lab sessions
- **Participation in class**
- **Participation in discussion forum**
- ~~Developing small applications as project~~

Lab:

- Codetantra lab sessions / own Java compiler
- Live Q&A on Piazza / Codetantra meeting
  [Will update you shortly]

General information

Course site:

https://piazza.com/class/kdoc8dhop2a769

Feedback:

- **Feel free to contact me anytime**
  (Drop a mail to mg.cse.iiitg@gmail.com with a subject CS202:)

Happy Learning ☺

Warm Up Poll -1

Are you enjoying the online mode?

A. Yes
B. No
C. Somewhat

CS202: IT Workshop
Java

An Introduction

Ref:

1. Harvey Deitel, Paul Deitel: **Java How to Program**, 9/e, Prentice Hall India.

2. Internet

Source of Java

Image courtesy: https://traveltriangle.com/

Source of Java

courtesy: https://traveltriangle.com/

Image courtesy: wikipedia

- Most populous island in the world (Indonesia)
- Known for its coffee

History of Java

- Designed by **James Gosling**; initiated the project in 1991 along with Mike Sheridan, and Patrick Naughton.
- Released by Sun Microsystem with a promise of **WORA** (Write Once, Run Anywhere) functionality as Java 1.0
- Now available as free and open-source software (**FOSS**) from Oracle.
- Latest version is **Java SE 14** (SE: Standard Edition)

How is Java different? Popularity

Careers

SKILLS WANTED
SQL, JAVA, PYTHON, AND AWS TOP EMPLOYERS' WISH LISTS

WHAT TECH SKILLS DO U.S. EMPLOYERS want? Researchers at job search site Indeed took a deep dive into its database to answer that question. And, at least for now, expertise in SQL came out on top of the list of most highly sought-after skills, followed by Java. Python and Amazon Web Services (AWS) are coming on fast, and, should trends continue, may take over the lead in the next year or two.

Indeed's team considered U.S. English-language jobs posted on the site between September 2014 and September 2019; those postings encompassed 571 tech skills. Five years can be a long time in tech: Witness the rise of employer interest in Docker, an enterprise container platform. In 2014, it had a barely register-

Rank	Skill	2014 Share	2019 Share	Change
1	SQL	23.6%	21.9%	-7%
2	Java	19.7%	20.8%	6%
3	Python	8.1%	18.0%	123%
4	Linux	14.9%	14.9%	0%
5	Javascript	12.4%	14.5%	17%
6	AWS	2.7%	14.2%	418%
7	C++	10.6%	10.7%	1%
8	C	9.3%	10.3%	11%
9	C#	8.3%	9.3%	11%
10	.net	9.9%	8.4%	-15%

Source: IEEE Spectrum, Jan 2020

- Java has 20.8% share and it is still increasing

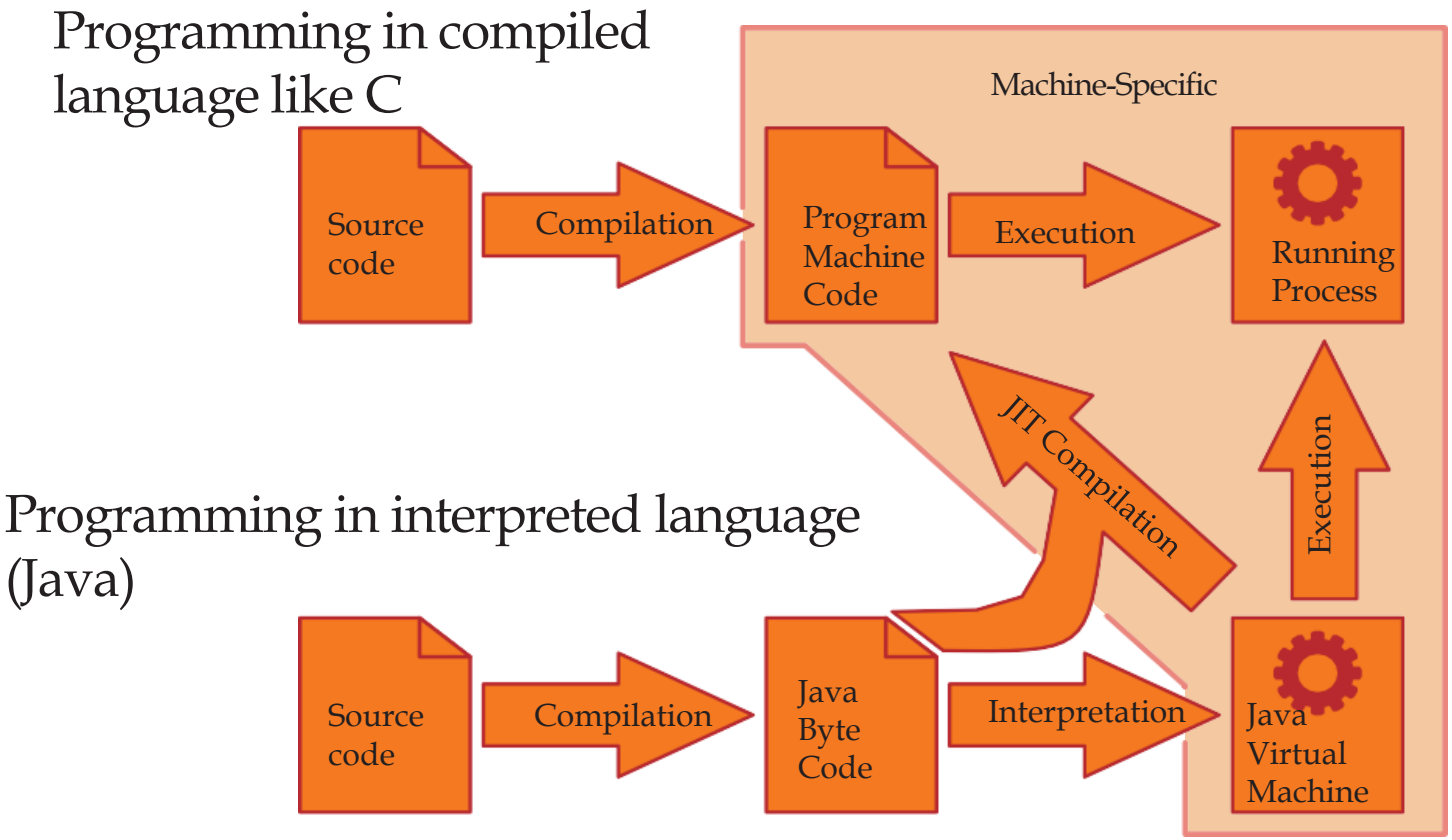
Java in computing world

- **Available in various technologies:**
  - Java SE, Java Embedded, Java Card, Java Micro Edition (ME), etc.
- **Android application**
  - Uses Dalvik Virtual Machine
- **GUI applications**
  - Rich support through Abstract Windowing Toolkit (AWT), Swing and JavaFX
- **Gaming applications**
  - Supports free open-source 3D-Engine: jMonkeyEngine
- **Application specific small devices**
  - TV set-top boxes, PDA, IoT devices, Microcontrollers, etc.
- **Big Data technologies**
  - Hadoop (a popular distributed file system) is written in Java

Imp features of Java

- **Object oriented**
  - Abstraction, Inheritance, Polymorphism, Encapsulation, etc.
  - Easier to design/model real-world scenario.
- **Portable**
  - Program written/compiled on one machine can run on another without modification
  - Java creates **bytecode** and bytecode is run by JVM
- **Safe and Secure**
  - No use of pointer
  - Automatic memory management
  - Bytecode verifier

Compilation and execution in Java



- Compilation in Java happens in two phases
  1. Compilation: Source code (.java) → Bytecode (.class)
  2. Bytecode interpretation by JVM / Just-in-time compilation

(Bytecode which are used frequently are compiled into machine code: Java HotSpot compilation)

Look of a typical Java program

A sample Java program.

```
import java.io.*

class Circle {
        double x,y; // The coordinates of the center
        double r; // The radius

        double circumference() {
        return 2*3.14159*r;
        }

        double area() {
        return (22/7)*r*r;
        }
}

public class Demo {
        public static void main(String args[]) {
                Circle c = new Circle();
                c.x = 0.0;
                c.y = 0.0;
                c.r = 5.0;

                System.out.println("Circumference" + c.circumference() );
                System.out.println("Area" + c.area() );
        }
}
```

Importing package

Data members → **Variables**

Member functions → **Methods**

Class containing **main()**

- Every java program contains at least one programmer-defined class

First Java program

The "HelloWorld" Program.

```
public class HelloWorld
{
    public static void main ( String [ ] args ){
    System.out.println("Hello,World!"); // print "Hello, World!" to console
  }
}
```

System.out.println prints a new line

- Running a Java program:
  - Write code in any text editor and run from Console/Terminal
  - Using IDE (Integrated Development Environment)
    e.g. Eclipse, IntelliJ IDEA, NetBeans, BlueJ, etc.

Running Java program

Using IDE

- Working of Eclipse (Screen share)

Console or Terminal (PATH and CLASSPATH variable need to be set)

```
$ javac HelloWorld.java

$ java HelloWorld
```

To compile the program

To execute the program

Some common errors in the beginning

- Could not find or load main class
- Unsupported class version error

Good programming practice with Java

Naming

- ✓**Class**: begin with a *capital* letter and capitalize the first letter of each subsequent word (e.g. Circle, HelloWorld)
- ✓**Variable**: begin with a *small* letter and capitalize the first letter of each subsequent word (e.g. radius, isColored)
- ✓**Method**: begin with a *small* letter and capitalize the first letter of each subsequent word (e.g. draw(), fillColor())

Readability

- ✓Meaningful names to class, variable, method, etc.
- ✓One variable in one line
- ✓Proper indentation
- ✓Constant variable should be given proper name (*named constants*) (e.g. ARRAY_LENGTH instead of 10)

Efficiency

- ✓We will see during the course

What have we discussed today?

- **Characteristics of the course CS 202**
  - ✓Involves programming
  - ✓Many TAs available to help you in learning
- **Java programming language**
  - ✓Popularity, usage and important features of Java
  - ✓Typical look of a Java program
  - ✓HelloWorld (the first program) in Java
- **Notation to follow in Java programming**
  - ✓Class/variable/method names, Indentation, etc.

- **Homework: Spend time with the Java compiler**

Warp Up Poll

Did you enjoy today's class?

A. Yes
B. No
C. Somewhat