BIRZEIT UNIVERSITY

COMP231

Advanced Programming

By: Mamoun Nawahdah (Ph.D.)
2018/2019

Welcome to COMP231, one of the most

exciting

programming courses offered at Computer Science Department

Course Description

In this course, you will learn some of the concepts, fundamental syntax, and thought processes behind true **O**bject-**O**riented **P**rogramming (**OOP**)

Course Description

- Upon completion of this course, you'll be able to:
  - Demonstrate understanding of classes, constructors, objects, and instantiation.
  - Access variables and modifier keywords.
  - Develop methods using parameters and return values.
  - Build control structures in an object-oriented environment.
  - Convert data types using API methods and objects.
  - Design object-oriented programs using scope, inheritance, and other design techniques.
  - Create an object-oriented application using Java packages, APIs. and interfaces, in conjunction with classes and objects.

Logistics

- Instructor: **Mamoun Nawahdah** (WKS205)
- Text book:
  - Introduction To JAVA Programming, **10th/11th** edition.
  - Author: Y. Daniel Liang.
  - Publisher: Prentice Hall.
- Lab Manual:
  - **Title:** LABORATORY WORK BOOK (**COMP231 – 2017/2018**)

Special Regulations

- **Assignments**:
  - All assignments are **individual** efforts any duplicated copies will be treated as a cheating attempt which lead to **ZERO** mark.
  - Using code from the **internet** will be treated as cheating as well.
  - The assignments should be **submitted through Ritaj** within the specified deadline.
  - No late submissions are accepted even by **1 minute** after the deadline.

Special Class Regulations

- **Attendance** is mandatory. University regulations will be **strictly** enforced.
- **Mobile**: Keep it off during the class. If your mobile ring you have to leave the classroom **q**uickly, **q**uietly and don't come back.
- **Late**: you are expected to be in the classroom before the teacher arrival. After **5** minutes you will not allowed entering the classroom.

Grading Criteria

Midterm exam	30%
4 Assignments	**10%**
4 Quizzes	**15%**
Final Practical Exam	10%
Final exam	35%

Course Outline

Topics	Chapter	# of lectures
Introduction to Java	1-8	6
Objects and Classes	9	3
Strings	4.4, 10.10, 10.11	2
Thinking in Objects	10	2
Inheritance and Polymorphism	11	3
Midterm Exam (30%)		
Abstract Classes and Interfaces	13	3
Exception Handling and Text I/O	12	3
JavaFX Basics	14	3
JavaFX UI Controls	16	3
Event-Driven Programming	15	3
Final Exam (35%)		

Lab Outline

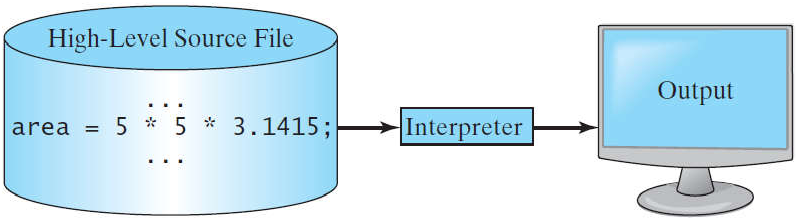
Lab #	Title	Quizzes
1	Program structure in Java	
2	Structure Programming - Revision	
3	Methods	**Q1**
4	Arrays and Object Use	
5	Object-Oriented Programming	
6	Strings	**Q2**
7	Inheritance and Polymorphism	
8	Abstract classes and Interfaces	
9	Exception handling and text I/O	**Q3**
10	JavaFX basics and UI controls	
11	Event-Driven Programming	
12	Extra lab: JavaFX and Event-Driven Programming	**Q4**
Practical Final Exam (10%)		

Interpreting/Compiling Source Code

- A program written in a **high-level language** is called a ***source program*** or ***source code***.
- Because a computer cannot understand a source program, a source program must be translated into **machine code** for execution.
- The translation can be done using another programming tool called an ***interpreter*** or a ***compiler***.

Interpreting Source Code

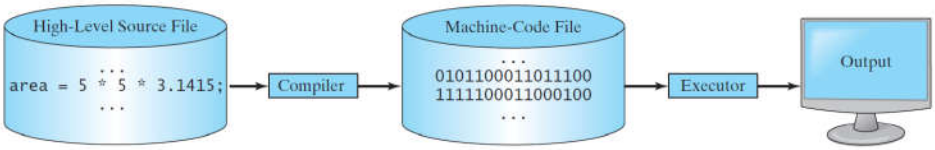
- An interpreter reads one statement from the source code, translates it to the machine code or **virtual machine code**, and then executes it right away, as shown in the following figure.



- Note that a statement from the source code may be translated into several machine instructions.

Compiling Source Code

- A compiler translates the entire source code into a machine-code file, and the machine-code file is then executed, as shown in the following figure.



Why Java?

- Java is a general purpose programming language.
- Java is the Internet programming language.

James Gosling, the creator of Java (2008)

Java, Web, and Beyond

- Java can be used to develop standalone applications.
- Java can be used to develop applications running from a browser.
- Java can also be used to develop applications for hand-held devices.
- Java can be used to develop applications for Web servers.

Characteristics of Java

- Java Is Simple
- Java Is Object-Oriented
- Java Is Distributed
- Java Is Interpreted
- Java Is Robust
- Java Is Secure
- Java Is Architecture-Neutral
- Java Is Portable
- Java's Performance
- Java Is Multithreaded
- Java Is Dynamic

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JDK Versions

- JDK 1.02 (1995)
- JDK 1.1 (1996)
- JDK 1.2 (1998)
- JDK 1.3 (2000)
- JDK 1.4 (2002)
- JDK 1.5 (2004) a. k. a. JDK 5 or Java 5
- JDK 1.6 (2006) a. k. a. JDK 6 or Java 6
- JDK 1.7 (2011) a. k. a. JDK 7 or Java 7
- **JDK 8 (2014)**
- **JDK 10 (March 2018)**
- **JDK 11 (September 2018)**
- **JDK 12 (March 2019)**

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JDK Editions

- **Java Standard Edition (J2SE)**
  - J2SE can be used to develop client-side standalone applications or applets.
- **Java Enterprise Edition (J2EE)**
  - J2EE can be used to develop server-side applications such as Java servlets, Java ServerPages, and Java ServerFaces.
- **Java Micro Edition (J2ME).**
  - J2ME can be used to develop applications for mobile devices such as cell phones.

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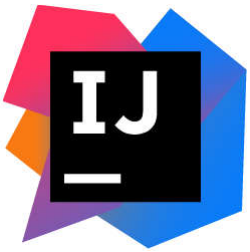
Popular Java IDEs

IDE ➔ **I**ntegrated **D**evelopment **E**nvironment



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A Simple Java Program

```
// This program prints Welcome to Java!
public class Welcome
{
  public static void main(String[] args)
  {
    System.out.println("Welcome to Java!");
  }
}
```

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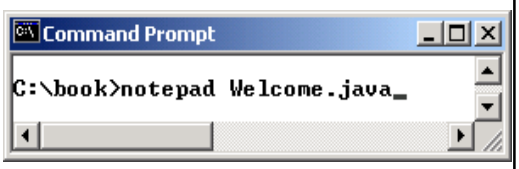
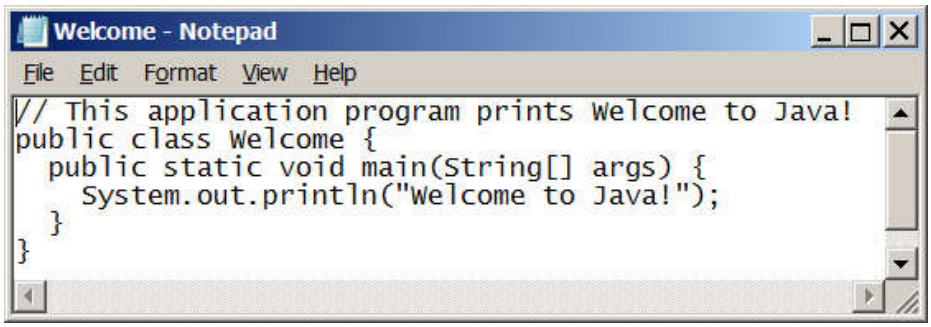
Creating and Editing Using NotePad

To use NotePad, type:

notepad Welcome.java

from the **DOS** prompt.





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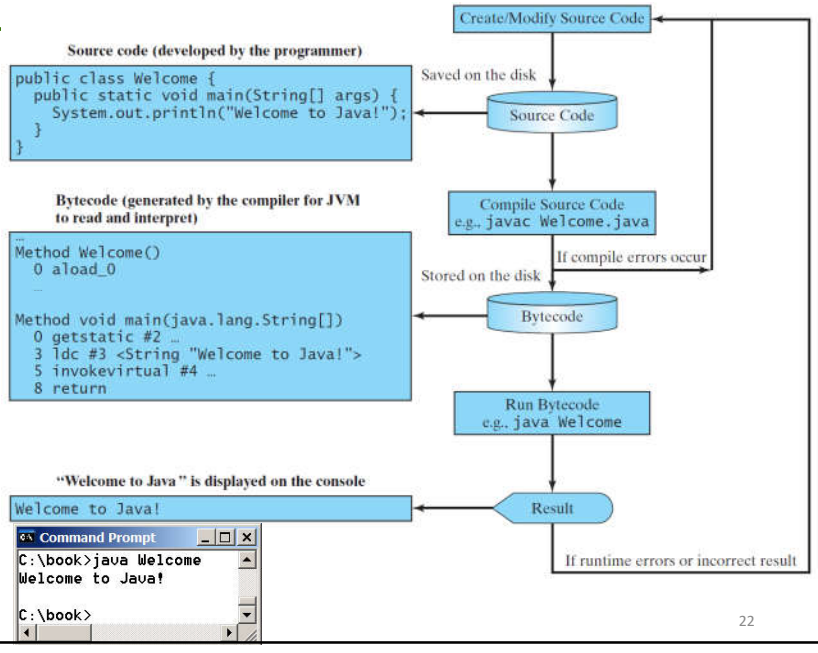
Creating, Compiling, and Running Programs



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Compiling and Running Java from the Command Window (cmd)

- Set path to JDK **bin** directory

  set path=c:\Program Files\java\jdk1.8.0_xx\bin

- Set **classpath** to include the current directory

  set classpath=.

- Compile:

  javac Welcome.java

- Run:

  java Welcome

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Anatomy of a Java Program

- Class name
- Main method
- Statements
- Statement terminator
- Reserved words
- Comments
- Blocks

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Class Name

- Every Java program must have **at least** one class.
- Each class has a name.
- By **convention**, class names start with an uppercase letter.
- In this example, the class name is **Welcome**.

```
//This program prints Welcome to Java!
public class Welcome {
  public static void main(String[] args) {
        System.out.println("Welcome to Java!");
  }
}
```

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Main Method

- In order **to run a class**, the class must contain a method named **main**.
- The program is executed from the **main** method.

```
//This program prints Welcome to Java!
public class Welcome {
  public static void main(String[] args) {
    System.out.println("Welcome to Java!");
  }
}
```

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Statement

❖ A statement represents an action or a sequence of actions.

❖ The statement

System.out.println("Welcome to Java!")

in the program is a statement to display the greeting "***Welcome to Java*!**".

```
public class Welcome {
  public static void main(String[] args) {
      System.out.println("Welcome to Java!");
  }
}
```

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Statement Terminator

❖ **Every** statement in Java ends with a semicolon

;

```
//This program prints Welcome to Java!
public class Welcome {
  public static void main(String[] args) {
     System.out.println("Welcome to Java!");
  }
}
```

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Reserved Words

❖ Reserved words or **keywords** are words that have a specific meaning to the compiler and cannot be used for other purposes in the program.

❖ For example, when the compiler sees the word **class**, it understands that the word after class is the name for the class.

```
//This program prints Welcome to Java!
public class Welcome {
  public static void main(String[] args) {
     System.out.println("Welcome to Java!");
  }
}
```

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Programming Style and Documentation

❖ Appropriate **Comments**.

❖ Naming **Conventions**.

❖ Proper **Indentation** and Spacing Lines.

❖ Block Styles.

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Naming Conventions

- Choose **meaningful** and descriptive names.
- Class names:
  - Capitalize the **F**irst **L**etter of each word in the name. For example, the class name **ComputeExpression**.

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Proper Indentation and Spacing

- **Indentation**
  - Indent **two** spaces.
- **Spacing**
  - Use blank line to separate segments of the code.

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Block Styles

Next-line style

```
public class Test
{
  public static void main(String[] args)
  {
    System.out.println("Block Styles");
  }
}
```

End-of-line style

```
public class Test {
  public static void main(String[] args) {
    System.out.println("Block Styles");
  }
}
```

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Programming Errors

- **Syntax Errors**
  - Detected by the compiler
- **Runtime Errors**
  - Causes the program to abort
- **Logic Errors**
  - Produces incorrect result

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