IT2205: PROGRAMMING I

INTRODUCTION

This is one of the 4 modules designed for Semester 2 of Bachelor of Information Technology Degree program.

CREDITS: 04

LEARNING OUTCOMES

On completion of this course, students will be able to design and develop programs for specified tasks using Java as an Object Oriented Programming Language.

MINOR MODIFICATIONS

When minor modifications are made to this syllabus, those will be reflected in the Virtual Learning Environment (VLE) and the latest version can be downloaded from the relevant course page of VLE. Please inform your suggestions and comments through the VLE. http://vle.bit.lk

ONLINE LEARNING MATERIALS AND ACTIVITIES

You can access all learning materials and this syllabus in the VLE: http://vle.bit.lk, if you are a registered student of BIT degree program. It is very important to participate in learning activities given in the VLE to learn this subject.

ONLINE ASSIGNMENTS

The assignments consist of two quizzes, assignment quiz 1 (It covers the first half of the syllabus) and assignment quiz 2 (It covers the second half of the syllabus). Maximum mark for a question is 10, minimum mark for a question is 0 (irrespective of negative scores). Final assignment mark is calculated considering 40% of assignment quiz 1 and 60% of assignment quiz 2. Pass mark for the online assignments in a course is 50. You are advised to do online assignments before the final exam of the course. It is compulsory to pass all online assignments to partially qualify to obtain year 1 certificate.

FINAL EXAMINATION

Final exam of the course will be held at the end of the semester. Each course in the semester 2 is evaluated using a two hour question paper which consists of 40-60 MCQs.

OUTLINE OF SYLLABUS

Topic	Minimum number of hours
• 1 - The history and evolution of Java	2

• 2 - Interacting with Java Programming environment	2
• 3 - Fundamentals of Java Programming	15
• 4 - Computer program design	5
• 5 - Object Orientation	13
• 6 - Packages and interfaces	5
• 7 - Exception handling	5
• 8 - Enumerations, Auto boxing and annotations	5
• 9 - Understanding generics	2
• 10 - Overview of some packages of the Java library	6
Total for the subject	**60**

REQUIRED MATERIALS

Main Reading:

Ref 1: Java: The Complete Reference ™, Eighth Edition by Herbert Schildt, Tata McGraw-Hill Edition 2011
Ref 2: Computer Program Design by Elizabeth A. Dickson, Tata McGraw-Hill Edition 2002

Supplementary Reading:

- Java SE Development Kit 7 Downloads
  http://www.oracle.com/technetwork/java/javase/downloads/jdk7-downloads-1880260.html

2. DETAILED SYLLABUS

1. The history and evolution of Java (2 hrs)

Instructional Objectives

Sub Topics

1.1. Java's Lineage
1.2. The birth of Modern Programming : C and C++
1.3. The creation of Java and Microsoft's C#
1.4. Java and Internet
  1.4.1. Java Applets
  1.4.2. Security
  1.4.3. Portability
1.5. The Bytecode
1.6. Java on the server Side

1.7. Features of Java
1.8. Evolution of Java
1.9. Understanding of the Java innovations

2. Interacting with Java Programming environment (2 hrs)

Instructional Objectives

Sub Topics

2.1. Installing and setting the Java environment in one's computer
2.2. First few programs
- 2.2.1. Writing and saving the Java source file
- 2.2.2. How to compile and execute a Java program
- 2.2.3. Structure of a Java program
- 2.2.4. Using blocks of code and issues of lexical in Java at a glance
  - 2.2.4.1. Block of code
  - 2.2.4.2. Whitespace
  - 2.2.4.3. Identifiers
  - 2.2.4.4. Literals
  - 2.2.4.5. Comments
  - 2.2.4.6. Separators
- 2.2.5. Java keywords

3. Fundamentals of Java Programming (15 hrs)

Instructional Objectives

Sub Topics

3.1. Data types and variable in Java
- 3.1.1. Data types
  - 3.1.1.1. Java is a strongly types language
  - 3.1.1.2. The primitive types
  - 3.1.1.3. A closer look at literals
    - 3.1.1.3.1. Integer literals
    - 3.1.1.3.2. Floating point literals
    - 3.1.1.3.3. Boolean literals
    - 3.1.1.3.4. Character literals
    - 3.1.1.3.5. String literals
- 3.1.2. Variables
  - 3.1.2.1. Variable declarations
  - 3.1.2.2. Conversions in naming variables
  - 3.1.2.3. Dynamic initialization
  - 3.1.2.4. The scope and life time of variables
  - 3.1.2.5. Type conversion and casting
  - 3.1.2.6. Automatic type promotion in expressions
  - 3.1.2.7. The type promotion rules

3.2. Operators
- 3.2.1. Arithmetic operators
- 3.2.2. Increment and decrement
- 3.2.3. Relational operators

- 3.2.4. Boolean logical operators
- 3.2.5. The bitwise operators
- 3.2.6. The assignment operator
- 3.2.7. The? : operator
- 3.2.8. Operator precedence
- 3.2.9. Usage of parenthesis

3.3. Control statements
- 3.3.1. Selection statements
  - 3.3.1.1. If
  - 3.3.1.2. Switch
- 3.3.2. Iteration statements
  - 3.3.2.1. For
  - 3.3.2.2. Do while
  - 3.3.2.3. While
  - 3.3.2.4. Nested loops
- 3.3.3. Enhanced for loop
- 3.3.4. Jump statements
  - 3.3.4.1. Break
  - 3.3.4.2. Continue
  - 3.3.4.3. Return

3.4. Arrays
- 3.4.1. One dimensional
- 3.4.2. Multi dimensional
- 3.4.3. Using command line arguments

4. Computer program design (5 hrs)

Instructional Objectives

Sub Topics

4.1. Overview of an algorithm

4.2. Program design
- 4.2.1. Introduction to program design
- 4.2.2. Flowcharts and design structures
- 4.2.3. Pseudocode
- 4.2.4. Other design tools
- 4.2.5. Modules , flags and priming reads
- 4.2.6. Structures design and Interactive programs
- 4.2.7. Sorting
- 4.2.8. Merging and matching two input files
- 4.2.9. File updates
- 4.2.10. Non sequential files

5. Object Orientation (13 hrs)

Instructional Objectives

Sub Topics

5.1. Introducing classes

5.2. A closer look at methods and classes
5.3. Recursions
5.4. Understanding of object orientation features
5.5. Introducing access control
5.6. Understanding static and final key words
5.7. Nested and inner classes
5.8. Inheritance

6. Packages and interfaces (5 hrs)

Instructional Objectives

Sub Topics

6.1. Packages
- 6.1.1. Defining a package
- 6.1.2. Finding packages and CLASSPATH
- 6.1.3. Access protection
- 6.1.4. Importing a package

6.2. Interfaces
- 6.2.1. Defining an interface
- 6.2.2. Implementing interfaces
- 6.2.3. Nested interfaces
- 6.2.4. Applying interfaces
- 6.2.5. Variables in interfaces

7. Exception handling (5 hrs)

Instructional Objectives

Sub Topics

7.1. Exception handling fundamentals
7.2. Exception types
7.3. Uncaught exceptions
7.4. Using exceptions
- 7.4.1. Try
  - 7.4.1.1. Nested try statements
- 7.4.2. Catch
  - 7.4.2.1. Multiple catch clauses
- 7.4.3. Throw
- 7.4.4. Throws
- 7.4.5. Finally
- 7.4.6. Java’s built in Exceptions
- 7.4.7. Creating one’s own exception sub classes
- 7.4.8. Chained exceptions
- 7.4.9. Newly added exception features of JDK new versions

8. Enumerations, autoboxing and annotations (5 hrs)

Instructional Objectives

Sub Topics

8.1. Enumerations
- 8.1.1. Enumeration fundamentals
- 8.1.2. The values() and valueOf() methods

8.2. Type wrappers

8.3. Autoboxing
- 8.3.1. Autoboxing and methods
- 8.3.2. Autoboxing/ unboxing occurs in expressions
- 8.3.3. Boolean and character values
- 8.3.4. Autoboxing and preventing errors

8.4. Annotations
- 8.4.1. Basics
- 8.4.2. Specifying a retention policy
- 8.4.3. Obtaining annotations at run time by use of reflection
- 8.4.4. Built in annotations

9. Understanding generics (2 hrs)

Instructional Objectives

Sub Topics

9.1. What are generics

9.2. Generics work only with objects

9.3. Generic types differ based on their type arguments

9.4. How generics improve type safety

9.5. A general form of a generic class

10. Overview of some packages of the Java library (6 hrs)

Instructional Objectives

Sub Topics

10.1. String handling
- 10.1.1. The string constructors
- 10.1.2. String length
- 10.1.3. Special string operations
- 10.1.4. Character extractions
- 10.1.5. String comparisons
- 10.1.6. Searching a string
- 10.1.7. Modifying a string
- 10.1.8. Data conversion using valueOf()
- 10.1.9. Changing the case of a character within a string
- 10.1.10. Additional string methods

- 10.1.11. String buffer
- 10.1.12. String builder

10.2. Introduction to collection framework and java.util package
- 10.2.1. Using Scanner class
- 10.2.2. Collection framework
  - 10.2.2.1. Collection overview
  - 10.2.2.2. The collection interfaces
  - 10.2.2.3. The collection classes
  - 10.2.2.4. Accessing a collection via an iterator

10.3. Java input and output basics in java.io package
- 10.3.1. Input and output basics
- 10.3.2. Byte stream and character stream
- 10.3.3. The predefined streams
- 10.3.4. Reading console input
- 10.3.5. Writing console output
- 10.3.6. The printwriter class
- 10.3.7. Reading and writing files
- 10.3.8. Automatically closing a file

10.4. java. applet class
- 10.4.1. Two types of applets
- 10.4.2. Applet basics
- 10.4.3. The applet class
- 10.4.4. Applet architecture
- 10.4.5. Applet skeleton
- 10.4.6. Applet initialization and termination
- 10.4.7. Simple applet display methods
- 10.4.8. The HTML applet tag

PLATFORM

Any standard PC with a standard Java Compiler (JDK 1.7) running on a Windows/Linux platform. A visual development toolkit may be optionally used.

Note: *Under the detailed syllabus, page numbers of relevant text are given for each topic only as a guideline for minimal references based on the recommended main reading. These references are generally sufficient to understand the concepts and measure the expected depth of the content.*