MANIPAL UNIVERSITY JAIPUR

School of Computing and Information Technology

Department of Information Technology

Course Hand-out

Object Oriented Programming using Java | CS 1304 | 4 Credits | 3 1 0 4

Session: July-November, 2019

Faculty: Dr. Ghanshyam Raghuwanshi

Class: B.Tech CCE

A.   Introduction:

Object oriented techniques have revolutionized the software development process and are used tremendously in IT industry to develop software products of various kinds. The course is designed to give students an in-depth understanding of the basic concepts of object-oriented programming such as encapsulation, inheritance and polymorphism using Java programming language as an aidind tool. The course curriculum and structure has been divided into eight basic modules which covers the programming aspects related with object oriented domain such as exception handling, multithreading, GUI programming, event handling etc. The course will be taught with the help of several teaching aides such as power point presentation and via live debugging and execution demonstrations of several programming problems using Eclipse tool.

The main objective of the course are as follows:

- To teach students about the basics of classes and objects using Java programming language
- To enable the students to properly use the basic object oriented pillars such as encapsulation, inheritance and polymorphism.
- To enable the students to understand the basic difference between a class and an interface.
- To teach students about the implementation aspect of various basic data structures such as Linked Lists and Arrays using object oriented techniques
- To teach students how to provide various types of inheritance and polymorphism using classes and interfaces
- To introduce students about the role of modern programming constructs such as exceptions in modern programming languages
- To teach students about the basic of Multithreading, GUI Programming and Event handling

B.   Course Outcomes: At the end of the course, students will be able to

[1304.1].   Understand and learn how to compile and execute a simple as well as complex Java Application using Command Based Interface as well as using Eclipse Tool.

[1304.2].   Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces for better programming skills.

[1304.3].   Describe and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.

[1304.4].   Learn and Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework

[1304.5].   Understand, Learn and finally implement the use of advanced programming constructs/features such as exception handling, multithreading and event handling in real-life programming domains.

[1304.6].   Visualize a real world problem in the form of various collaborating classes and objects for enhancing employability.

C. PROGRAM OUTCOMES AND PROGRAM SPECIFIC OUTCOMES

PROGRAM OUTCOMES

[PO.1]. **Engineering knowledge**: : Apply the knowledge of basic science and fundamental computing in solving complex engineering problems

[PO.2]. **Problem analysis**: Identify, formulate, research literature, and analyze complex engineering problems reaching substantiated conclusions using first principles of mathematics, natural sciences, and engineering sciences.

[PO.3]. **Design/development of Computing solutions**: Design solutions for complex IT engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the Information oriented public health and safety, and the cultural, societal, and environmental considerations

[PO.4]. **Conduct investigations of complex problems**: Use IT domain research-based knowledge and research methods including design of experiments, analysis and interpretation of data, and synthesis of the information to provide valid conclusions

[PO.5]. **Modern tool usage**: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modelling to complex engineering activities with an understanding of the limitations

[PO.6]. **The engineer and society**: Apply reasoning informed by the contextual knowledge to assess societal, health, safety, legal, and cultural issues and the consequent responsibilities relevant to the professional engineering practice

[PO.7]. **Environment and sustainability**: Understand the impact of the professional engineering solutions in societal and environmental contexts, and demonstrate the knowledge of, and need for sustainable development

[PO.8]. Apply ethical principles and commit to professional ethics and responsibilities and norms of the engineering practices

[PO.9]. **Individual and team work**: Function effectively as an individual, and as a member or leader in diverse IT teams, and in multidisciplinary settings.

[PO.10]. **Communication**: Communicate effectively on complex computing engineering activities with the engineering community and with society at large, such as, being able to comprehend and write effective reports and design documentation, make effective presentations, and give and receive clear instructions

[PO.11]. **Project management and finance:** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work, as a member and leader in a team, to manage projects and in multidisciplinary environments

[PO.12]. **Life-long learning**: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change

PROGRAM SPECIFIC OUTCOMES

The graduation from B.Tech. in Information Technology will empowers the student:

[PSO 1]: To apply creativity in support of the design, simulation, implementation and inference of existing and advanced technologies.

[PSO 2]: To participate & succeed in IT oriented jobs/competitive examinations that offer inspiring & gratifying careers.

[PSO 3]: To recognize the importance of professional developments by pursuing postgraduate studies and positions.

D.   Assessment Plan:

Criteria	Description	Maximum Marks
Internal Assessment (Summative)	Sessional Exam I (Close Book)	15
	Sessional Exam II (Close Book)	15
	In class Quizzes	30
End Term Exam (Summative)	End Term Exam (Close Book)	40
	Total	100
Attendance (Formative)	A minimum of 75% Attendance is required to be maintained by a student to be qualified for taking up the End Semester examination. The allowance of 25% includes all types of leaves including medical leaves.	

E.   SYLLABUS

F.   Introduction: OOP paradigm, the creation of java, the java buzzwords; C, C++ and Java comparison;**Java Basics:** Compilation and execution of a java program, access modifiers, garbage collection; **Class and Objects:** Class definition, creating objects, role of this keyword, garbage collection, finalize() method, method overloading, objects as parameters, argument passing, returning objects, access control, final, nested and inner classes; **I/O Basics:** Reading console input, writing console output, Files **Array and Strings:** Arrays in java, 1-D, 2-D and dynamic arrays, string basics, string comparison and manipulation; **Inheritance:** Inheritance and its types, abstract class, inner and outer class, super, final, static keywords; **Package and Interface:** In-built packages and user define packages, role of interface, polymorphism via inheritance; **Collection Framework & Generics:** List, set, map, generic classes; **Exception Handling:** Errors and exceptions, types of exceptions, handling exceptions, **Multithreading:** Thread class, runnable, thread life cycle, synchronization, thread priority; **Event Ha ndling and GUI Programming:** Events, action listener, swing package;

G.   TEXT BOOKS

- **Java:** The Complete Reference (9th Edition), By Herbert Schildt, McGraw Hill Education, ISBN-10:0071808558, ISBN-13: 978-0071808552

H.   REFERENCE BOOKS

1. Balagurusamy E, "Object Oriented Programming with Java", Tata McGraw Hill, 2011.
2. Arnold K, & Gosling J, "The Java Programming Language", 2002.
3. Horstmann CS, "Big Java", Wiley's Interactive Edition, 2015.

I. Lecture Plan:

Lectures	Major Topics	Topics	Mode of Delivery	Corresponding CO	Mode Of Assessing CO
1.		Introduction and Course Hand-out briefing	Lecture	NA	
2.		C, C++ and Java Comparison, Java Byte Code ,Java Buzzwords, Java SE 8	Lecture	1304.1	Mid Term I, Quiz & End Term
3.	History and Evolution and overview of java (1-7 Lecture)	Lexical issues, java keywords	Lecture	1304.1	Mid Term I, Quiz & End Term
4.		OOP Programming, First Simple program	Lecture	1304.1	Mid Term I, Quiz & End Term
5.		Control Statements	Flipped Class	1304.1	Mid Term I, Quiz & End Term
6.		Operators	Flipped Class	1304.1	Mid Term I, Quiz & End Term
7.		Tutorial	Activity	1304.1	Mid Term I, Quiz & End Term
8.	Data Types, Variables and Arrays (8-11 Lecture)	Primitive Types, Floating point, Characters, Booleans	Flipped Class	1304.1	Mid Term I, Quiz & End Term
9.		Literals, Variables, Type Conversion and casting, wrapper classes , Boxing and Unboxing	Lecture	1304.1	Mid Term I, Quiz & End Term
10.		1D Arrays, 2D Array, multi dimension Array, Variable	Lecture	1304.1	Mid Term I, Quiz & End Term
11.		Tutorial	Activity	1304.1	Mid Term I, Quiz & End Term
12.	Introduction to Classes (12-17 Lecture)	Class Fundamentals, Declaring Objects	Lecture	1304.2 & 1304.6	Mid Term I, Quiz & End Term
13.		Methods in Classes, returning values, parameterized	Lecture	1304.2 & 1304.6	Mid Term I, Quiz & End Term
14.		Constructors, parameterized constructors	Flipped Class	1304.2 & 1304.6	Mid Term I, Quiz & End Term
15.		This keyword, This Constructor, Constructor Chaining	Lecture	1304.2	Mid Term I, Quiz & End Term
16.		Tutorial	Activity	1304.2	Mid Term I, Quiz & End Term
17.		Garbage Collection, finalize() method	Lecture	1304.2	Mid Term I, Quiz & End Term
18.	Classes and its Methods(18-23 lecture)	Overloading Methods, Using Objects as parameters, Argument passing, Returning Objects	Lecture	1304.2	Mid Term I, Quiz & End Term
19.		Recursion, Access Control	Lecture	1304.2 & 1304.3	Mid Term I, Quiz & End Term
20.		Tutorial	Activity	1304.2	Mid Term I, Quiz & End Term
21.		Static, final, Nested and Inner class	Lecture	1304.2 & 1304.3	Mid Term II, Quiz & End Term
22.		Variable length arguments	Lecture	1304.2 & 1304.3	Mid Term II, Quiz & End Term
23.		Tutorial	Lecture	1304.2 & 1304.3	Mid Term II, Quiz & End Term
24.	I/O Basics (24-26 lecture)	Using Command line arguments ,I/O Basics, reading	Flipped Class	1304.1 & 1304.2	Mid Term II, Quiz & End Term
25.		PrintWriter Class, Scanner Class	Flipped Class	1304.1 & 1304.2	Mid Term II, Quiz & End Term
26.		reading and Writing Files, Closing files	Lecture	1304.1 , 1304.2 &1304.5	Mid Term II, Quiz & End Term
27.	Inheritance (27-29 Lecture)	Inheritance Basics, Using Super, Creating multilevel	Lecture	1304.3	Mid Term II, Quiz & End Term
28.		Method overriding, Dynamic method dispatch, Using	Lecture	1304.3	Mid Term II, Quiz & End Term
29.		Tutorial	Activity	1304.3	Mid Term II, Quiz & End Term
30.	Packages and	Packages, Access protection, Importing packages, static	Lecture	1304.3	Mid Term II, Quiz & End Term

31.	Interfaces (30-34 lecture)	Interfaces	Lecture	1304.3	Mid Term II, Quiz & End Term
32.		Default interface methods	Flipped Class	1304.3	Mid Term II, Quiz & End Term
33.		static methods in interfaces	Lecture	1304.3	Mid Term II, Quiz & End Term
34.		Tutorial	Activity	1304.3	Mid Term II, Quiz & End Term
35.	Exception Handling (35-38 lecture)	Fundamentals, Exception types, Uncaught Exceptions,	Lecture	1304.2 & 1304.6	Mid Term II, Quiz & End Term
36.		Using try and catch, multiple catch clauses, nested try	Lecture	1304.2 & 1304.6	Mid Term II, Quiz & End Term
37.		Throw, throws, finally, built-in exceptions, creating own exception	Lecture	1304.2 & 1304.6	Mid Term II, Quiz & End Term
38.		Tutorial	Activity	1304.5	Mid Term II, Quiz & End Term
39.	Multithreaded Programming (39-42 lecture)	Thread Model: thread priorities, synchronization	Flipped Class	11304.2 & 1304.6	Quiz & End Term
40.		main thread, creating single thread and multiple threads, using isAlive(), join()	Lecture	1304.2 & 1304.6	Quiz & End Term
41.		Interthread communication, suspending, resuming and stopping threads, using multithreads	Lecture	1304.2 & 1304.6	Quiz & End Term
42.		Tutorial	Activity	1304.5	Quiz & End Term
43.	String Handling (43-45 lecture)	Constructors, Constructor chaining, string operations	Lecture	1304.4	Quiz & End Term
44.		Character extraction, comparision, searching and	Lecture	1304.4	Quiz & End Term
45.		String Class Methods and String Buffer Class	Flipped Class	1304.4	Quiz & End Term
46.	Generics Class(46-49 lecture)	Collection framework, Arraylist ,	Lecture	1304.4	Quiz & End Term
47.		LinkList, HashMap,Vector	Lecture	1304.4	Quiz & End Term
48.		Making own generics class	Lecture	1304.4	Quiz & End Term
49.		Tutorial	Activity	1304.4	Quiz & End Term
50.	GUI and Event Handling (50-52 Lecture	GUI lifecycle, Events, Events listener, adapter classes	Flipped Class	1304.4 & 1304.5	Quiz & End Term
51.		Different Event classes	Lecture	1304.4 & 1304.5	Quiz & End Term
52.		Event Listener Interfaces	Lecture	1304.4 & 1304.5	Quiz & End Term

A. Course Articulation Matrix: (Mapping of COs with POs)

CO	STATEMENT	CORRELATION WITH PROGRAM OUTCOMES												CORRELATION WITH PROGRAM SPECIFIC OUTCOMES		
		PO 1	PO 2	PO 3	PO 4	PO 5	PO 6	PO 7	PO 8	PO 9	PO 10	PO 11	PO 12	PSO 1	PSO 2	PSO 3
CS 1304.1	Students will be able to understand and learn how to compile and execute a simple as well as complex Java Application using Command Based Interface as well as using Eclipse Tool.	1	2	2	2	-	-	-	-	1	1	1	1	2	-	-
CS 1304.2	Learn and apply the concepts of encapsulation and abstraction using class, objects and interfaces.	2	2	2	2	-	-	-	-	1	-	-	1	2	-	-
CS 1304.3	Students will be able to develop and Implement various inheritance and polymorphism forms using Java Classes and Interfaces.	3	2	2	1	-	-	-	-	1	-	-	1	3	-	-
CS 1304.4	Student will be able to Implement various collection data structure such as linked lists, queues, stacks using Java's collection framework.	3	2	2	1	-	-	-	-	1	-	-	1	2	-	-
CS 1304.5	Student will be able to understand, learn and finally Implement the use of advanced programming constructs/features such as exception handling, multithreading and event handling in real-life programming domains.	3	2	2	2	-	-	-	-	1	-	-	1	2	-	-
CS1304.6	Students will be able to visualize a real world problem in the form of various collaborating classes and objects	1	2	1	1	-	-	-	-	1	-	-	2	2	-	-

1- Low Correlation; 2- Moderate Correlation; 3- Substantial Correlation