



**BIRLA INSTITUTE OF TECHNOLOGY AND SCIENCE, Pilani**  
**Pilani Campus**  
**AUGS/ AGSR Division**

**SECOND SEMESTER 2020-21**  
**COURSE HANDOUT**

**Date: 14.01.2021**

In addition to part I (General Handout for all courses appended to the Time table) this portion gives further specific details regarding the course.

**Course No** : CS F213  
**Course Title** : Object Oriented Programming  
**Instructor-in-Charge** : Dr. J. Jennifer Ranjani (jennifer.ranjani@pilani.bits-pilani.ac.in)  
**Instructor(s)** : Dr. Avinash Gautam (avinash@pilani.bits-pilani.ac.in)  
**Lab Instructors** : Shail Saharan (p20170404@pilani.bits-pilani.ac.in)  
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**1. Course Description:**

This course provides a student with an in-depth understanding of object-oriented programming, object oriented analysis and design, and design patterns. Java programming language is chosen as a vehicle to teach the concept of object orientation. The course is taught with live demonstrations, running and debugging several examples, on tools like Eclipse. The later part of the course focuses on analysis and design of object oriented software system. After the completion of this course a student should be able to effectively realize and implement real world problems using object oriented principles and techniques.

**2. Scope and Objective of the Course:**

- Gives in-depth understandings of object-oriented programming using the java programming language, object oriented analysis and design, and design patterns.
- In the classroom the course will be taught with live demonstrations, running and debugging several examples on tools like Eclipse.
- The later part of the course focuses on designing object-oriented software.

**3. Text Books:**

- T1. Java: The Complete Reference, Herbert Schildt, McGraw Hill Education, Tenth Edition, 2017  
T2. Object Oriented Design & Patterns, Cay Horstmann, John Wiley & Sons, 2004

**4. Reference Books:**

- R1. Java™ Design Patterns – A Tutorial, James W. Cooper, Addison-Wesley, 2000

**4. Course Plan**

Module Number	Lecture session	Reference	Learning Outcome
1. Object-Oriented and Java Basics (06 Lectures)	L1.1. Object-Oriented Basics	T1, Ch. 2	<ul style="list-style-type: none"><li>- Object and Class Basics</li><li>- Basic Pillars of Object-Oriented Programming<ul style="list-style-type: none"><li>o Abstraction</li><li>o Encapsulation</li><li>o Inheritance</li><li>o Polymorphism</li></ul></li></ul>
	L1.2. Java Programming Syntax	T1, Ch. 2-5	<ul style="list-style-type: none"><li>- Java Program Structure</li><li>- Compiling and Executing a Simple Java Application</li><li>- Types of Variables in Java</li><li>- Primitive Types in Java</li><li>- Type Promotion and Type Casting Rules</li></ul>



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			<ul style="list-style-type: none"> <li>- Operators</li> <li>- Control statements</li> </ul>
	L1.3 – 1.4 Defining Classes and Object Creation	T1, Ch. 6	<ul style="list-style-type: none"> <li>- Defining Classes and Access Modifiers</li> <li>- Creating Objects</li> <li>- Role of Constructors</li> <li>- Accessing Instance Fields and Methods</li> <li>- Local Variables vs. Instance Variables</li> <li>- Mutable and Immutable Objects</li> <li>- Command-Line Arguments (<b>lab</b>)</li> <li>- Reading Input from console using Scanner class (<b>lab</b>)</li> <li>- Wrapper classes and Autoboxing</li> <li>- UML representation of a Class</li> </ul>
	L1.5 Use of static final keywords in Java, Method Overloading, Objects as Parameters	T1, Ch. 7	<ul style="list-style-type: none"> <li>- Use of static and final keywords</li> <li>- Method Overloading</li> <li>- Constructor Overloading</li> <li>- Objects as Parameters to Methods</li> </ul>
2. Arrays and String in Java ( <b>02 Lectures</b> )	L2.1 Arrays in Java	T1, Ch.3, Ch. 19	<ul style="list-style-type: none"> <li>- Implementing 1-D and 2-D Arrays</li> <li>- Role of Arrays class</li> </ul>
	L2.2. Strings in Java	T1, Ch. 17	<ul style="list-style-type: none"> <li>- String and StringBuffer class</li> <li>- String and StringBuffer methods (<b>lab</b>)</li> <li>- StringTokenizer</li> </ul>
3. Polymorphism and Inheritance in Java ( <b>08 Lectures</b> )	L3.1. Inheritance in Java	T1, Ch. 8	<ul style="list-style-type: none"> <li>- Extending classes and role of super keyword</li> <li>- Method Overriding [Super Type vs. Sub-Type Relationships]</li> <li>- UML representation of Inheritance relationship</li> </ul>
	L3.2. – 3.7 Abstract Classes, Abstract Methods and Interfaces	T1, Ch. 8, Class notes	<ul style="list-style-type: none"> <li>- Abstract methods and classes</li> <li>- Interfaces in Java [Class vs Interface]</li> <li>- Comparable and Comparator Interfaces</li> <li>- Nested and Inner Classes</li> <li>- Anonymous class and objects</li> <li>- Lambda expressions</li> <li>- UML representation of Abstract classes and methods</li> </ul>
4. Collections Framework of Java ( <b>07 Lectures</b> )	L4.1 – 4.3 Collections in Java	T1, Ch. 19, Class notes	<ul style="list-style-type: none"> <li>- Introduction to Collection Framework</li> <li>- Important Collection Interfaces and their methods</li> <li>- ArrayList and LinkedList classes</li> <li>- Iterators and ListIterators</li> <li>- Sets and Hash-Maps in Java</li> <li>- UML representation of Collection Classes</li> </ul>
	L4.4 – 4.6 Generic Programming	T1, Ch. 14 , Class Notes	<ul style="list-style-type: none"> <li>- Generic Form of a class</li> <li>- Generic Interfaces and Bounded Types</li> </ul>
5. Exception Handling Mechanism ( <b>02 Lectures</b> )	L5.1– 5.2 Exceptions in Java	T1, Ch. 10	<ul style="list-style-type: none"> <li>- Exception basics and types</li> <li>- Catching Exceptions</li> <li>- Writing your own Exceptions</li> </ul>



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6. Input/ Output in Java ( <b>01 Lectures</b> )	L6.1 File handling in Java	T1, Ch. 21 <<class notes>>	<ul style="list-style-type: none"> <li>- Create a file in java</li> <li>- Read a file in java using BufferedInputStream</li> <li>- Read a file in using BufferedReader</li> <li>- Write to a file in using FileOutputStream</li> <li>- Write to file in using BufferedWriter</li> <li>- Append to a file in java using BufferedWriter, PrintWriter, FileWriter</li> <li>- Delete file in using delete() method.</li> <li>- Rename file in Java using renameTo() method</li> </ul>
7. Multithreading ( <b>05 Lectures</b> )	L7.1 – 7.5 Multithreaded Programming in Java	T1, Ch. 11	<ul style="list-style-type: none"> <li>- Multithreading vs. Multitasking</li> <li>- Thread Class and methods</li> <li>- Creating your own Threads and Runnable Interface</li> <li>- Thread Synchronization</li> <li>- Inter Thread Communication</li> </ul>
8. Object Model ( <b>01 Lectures</b> )	L8.1 Java Object Model	T2, Ch. 7	<ul style="list-style-type: none"> <li>- The Java Type System</li> <li>- Type Inquiry</li> <li>- Object Class</li> <li>- Shallow and Deep Copy</li> </ul>
9. Software Design Patterns ( <b>08 Lectures</b> )	L10.1 – 10.8 Object-Oriented Design Patterns	Class notes Derived from reference book R1 and other online resources	<p>(a) <b>Creational Patterns [01 Lecture]</b></p> <ul style="list-style-type: none"> <li>- Singleton</li> <li>- Builder</li> <li>- Abstract Factory and Factory Method</li> </ul> <p>(b) <b>Structural Patterns [03 Lectures]</b></p> <ul style="list-style-type: none"> <li>- Adapter</li> <li>- Composite</li> <li>- Decorator</li> <li>- Bridge</li> </ul> <p>(c) <b>Behavioral Patterns [04 Lectures]</b></p> <ul style="list-style-type: none"> <li>- Iterator</li> <li>- State</li> <li>- Strategy</li> <li>- Observer</li> <li>- Command</li> <li>- Chain of Responsibility</li> </ul>

## 5. Lab Plan

Lab #	Topics to be Covered	*Week starting from
1.	Introduction to Eclipse IDE	25-Jan-2021
2.	Reading user input, Designing Simple Classes	01-Feb-2021
3.	Static variables, methods, and blocks, Object as Parameter, Wrapper Classes	08-Feb-2021
4.	Arrays, Passing arrays, Multi-dimensional arrays, Strings, StringBuffer, StringTokenizer	15-Feb-2021
5.	Inheritance, Polymorphism, Abstract Classes	08-Mar-2021



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6.	Interfaces [Comparable, Comparator], Inner classes and static inner classes, Lambda expressions, Anonymous inner classes	15-Mar-2021
7.	Collections [List, ArrayList, Iterator, ListIterator, LinkedList], Generics	22-Mar-2021
8.	Exception Handling and Text File I/O	29-Mar-2021
9.	Multi-threaded Programming in Java	05-Apr-2021
10.	Design Patterns (creational, structural and behavioral patterns)	26-Mar-2021

\*Tentative schedule. Prior notice will be sent if there is a change in the schedule.

**6. Evaluation Scheme:**

Component	Duration	Weightage (%)	Date & Time	Nature of component (Close Book/ Open Book)
Quiz-1	30 Min	10%	* (Feb 08 – Feb 12)	^ TBA
Quiz-2	30 Min	10%	* (Mar 29 – Apr 2)	^ TBA
Lab Test	75 mins	20%	^ (Apr 10 – Apr 17)	^ TBA
Mid Semester Exam	90 mins	25%	Will be announced by AUGSD	^ TBA
Comprehensive Exam	120 Min	35%	As announced in the Timetable	Open Book

\*During scheduled class hour, ^To be announced later

**7. Important Course Policies**

- a) Labs falling on holidays will not be cancelled or rescheduled. They will be conducted on the very same date and time.

**8. Chamber Consultation Hour** : The instructors can be contacted through email

**9. Notices** : Notices will be posted on Nalanda

**10. Make-up Policy** : Make-up will be granted only in case of hospitalization. One combined make-up quiz will be conducted in April 2021. Hence, the students must make sure that they don't skip both the quizzes.

Dr. Jennifer Ranjani  
**Instructor-in-charge**  
**Course No. CS F213**