## Course Information

**Program** : B.Sc. Engineering in CSE
**Course Code** : CSE 331
**Course Title** : Advanced Programming
**Course Credit** : 3.00
**Contact Hours** : $3_{hrs}$
**Semester** : Summer 2020
**Intake** : $39^{th}$ [Shift: Day]
**Section** : 01
**Prerequisites** : **CSE 121-Object Oriented Programming**

## Course Objectives

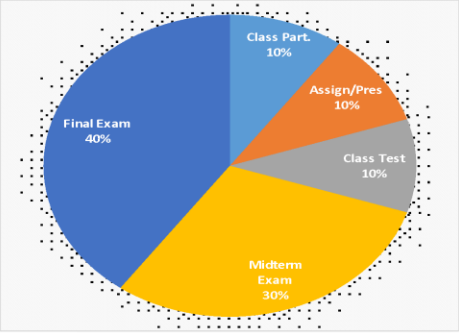
This course has been designed to teach the students the fundamental concepts of programming language Java. It focuses on how to write a program using the exclusive features such as OOP, interfaces, packages, multithreaded programming, exception handling, collection framework etc. of Java programming language. It emphasizes that the students learn to determine suitable logic for solving advanced object oriented problem using the exclusive features of Java.

## Course Synopsis

Fundamentals of OOP; Overview of Java Language; Constants, Variables, and Data Types; Operators and Expressions; Decision Making and Branching; Looping; and Classes, Objects and Methods; Inheritance; Polymorphism; Interface; Java Packages; Exception Handling; Multithreaded Programming; Managing Input/ Output Files with Java; Java Collections etc.

## Assessment

| | | |
|---|---|---|
| Class Participation | : | 10% |
| Assignment/Presentation | : | 10% |
| Class Test | : | 10% |
| Midterm Examination | : | 30% |
| Final Examination | : | 40% |




## Course Outcomes (COs)

After completion of this course students will be able to:

**CO1:** **Understand** the fundamentals of OOP features alongside basic programming concepts in java.

**CO2:** **Explain** exclusive features of java containing in OOP model, exceptions, multithreading, generic collections, files, etc.

**CO3:** **Design** solutions of different problems by applying OOP and java's features.

**CO4:** **Analyze** real life problem scenario and produce robust solution using java's advanced functionalities.

## Mapping of Course Outcomes (COs) to Program Outcomes (POs)

| CO | PO1 | PO2 | PO3 | PO4 | PO5 | PO6 | PO7 | PO8 | PO9 | PO10 | PO11 | PO12 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|
| CO1 | √ | | | | | | | | | | | |
| CO2 | √ | | | | | | | | | | | |
| CO3 | | | √ | | | | | | | | | |
| CO4 | | √ | | | | | | | | | | |

| Sl. No. | COs | Corresponding POs | Bloom's taxonomy domain/level | Delivery methods and activities | Assessment Tools |
|---|---|---|---|---|---|
| CO1 | **Understand** the fundamentals of OOP features alongside basic programming concepts in java. | PO1 | Understand | Class Lecture | Midterm |
| CO2 | **Explain** exclusive features of java containing in OOP model, exceptions, multithreading, generic collections, files, etc. | PO1 | Understand | Class Lecture | Midterm, Final |
| CO3 | **Design** solutions of different problems by applying OOP and java's features. | PO3 | Apply | Class Lecture | Midterm, Final |
| CO4 | **Analyze** real life problem scenario and produce robust solution using java's advanced functionalities. | PO2 | Analyze | Class Lecture | Final |

## Descriptions of Program Outcomes (POs)

| | |
|---|---|
| PO1 | **Engineering Knowledge (Cognitive):** Apply the knowledge of mathematics, science, engineering fundamentals and an engineering specialization to the solution of complex engineering problems. |
| PO2 | **Problem Analysis (Cognitive):** Identify, formulate, research the literature and analyze complex engineering problems and reach substantiated conclusions using first principles of mathematics, the natural sciences and the engineering sciences. |
| PO3 | **Design/Development of Solutions (Cognitive, Affective):** Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for public health and safety as well as cultural, societal and environmental concerns. |
| PO4 | **Investigation (Cognitive, Psychomotor):** Conduct investigations of complex problems, considering design of experiments, analysis and interpretation of data and synthesis of information to provide valid conclusions. |
| PO5 | **Modern Tool Usage (Psychomotor, Cognitive):** Create, select and apply appropriate techniques, resources and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. |
| PO6 | **The Engineer and Society (Affective):** Apply reasoning informed by contextual knowledge to assess societal, health, safety, legal and cultural issues and the consequent responsibilities relevant to professional engineering practice. |

| | |
|---|---|
| PO7 | **Environment and Sustainability (Affective, Cognitive):** Understand the impact of professional engineering solutions in societal and environmental contexts and demonstrate the knowledge of, and need for sustainable development. |
| PO8 | **Ethics (Affective):** Apply ethical principles and commit to professional ethics, responsibilities and the norms of the engineering practice. |
| PO9 | **Individual Work and Teamwork (Psychomotor, Affective):** Function effectively as an individual and as a member or leader of diverse teams as well as in multidisciplinary settings. |
| PO10 | **Communication (Psychomotor, Affective):** Communicate effectively about complex engineering activities with the engineering community and with society at large. Be able to comprehend and write effective reports, design documentation, make effective presentations and give and receive clear instructions. |
| PO11 | **Project Management and Finance (Cognitive, Psychomotor):** Demonstrate knowledge and understanding of the engineering and management principles and apply these to one's own work as a member or a leader of a team to manage projects in multidisciplinary environments. |
| PO12 | **Life-Long Learning (Affective, Psychomotor):** Recognize the need for and have the preparation and ability to engage in independent, life-long learning in the broadest context of technological change. |

## Weekly Schedule

| Week | Lecture | Course Topics | Remarks | CO | Exam (Mark) |
|---|---|---|---|---|---|
| 1 | 1 | History and evolution of Java: The Java Technology Phenomenon | Schildt Ch-1 | CO1 | |
| | 2 | OOP Programming Concepts, benefits of OOP, applications of OOP | Ch-2 | CO1 | |
| | 3 | Getting started with java program: simple java applications, compiling a program, and executing applications | " | CO1 | |
| 2 | 4 | Variables, Primitive Data Types, Arrays | Ch-3 | CO1 | |
| | 5 | Operators: Assignment, Relational, Unary, Arithmetic, Conditional and others. | Ch-4 | CO1 | |
| | 6 | Control statements: if-else, switch, for, while, do-while, for each loop, jump statements | Ch-5 | CO1 | |
| 3 | 7 | Class fundamentals, declaring objects, introducing methods | Ch-6 | CO2 | |
| | 8 | Constructors, this keyword, garbage collection. | " | CO2 | **Midterm (30)** |
| | 9 | Method overloading, constructors overloading, using object as parameters, argument passing, returning objects | Ch-7 | CO2 | |
| 4 | 10 | Introducing access control, understanding static, introducing final | " **[CT-1]** | CO2 | |
| | 11 | Introducing nested and inner classes, String class, Using command line arguments. | " | CO2 | |
| | 12 | Inheritance basics and practical example, Using super. | Ch-8 | CO3 | |
| 5 | 13 | Multilevel hierarchy, method overriding | " | CO3 | |
| | 14 | Dynamic method dispatch, Abstract Class, using final with inheritance | " | CO3 | |
| | 15 | Interface Basics, implementing interface, nested interface | Ch-9 | CO2 | |
| 6 | 16 | Applying interface, variables in interface, extending interface | " | CO3 | |
| | 17 | Packages and Interfaces: Packages, importing package, Defining and Implementing an Interface | " | CO2 | |
| | 18 | ***Review class for Mid-Term Examination*** | | | |
| 7 | **Midterm Week** | | | | |
| | 19 | Exception Handling: fundamentals, Exception types, Uncaught exceptions | ch10 | CO2 | |
| | 20 | Exception Handling contd: using try and catch, multiple catch clause, nested try statements, finally block | " | CO2 | |

| | | | | | |
|---|---|---|---|---|---|
| | 21 | Exception Handling contd: Throwing Exceptions, Java builtin exceptions, custom exception. | " | CO3 | **Final Exam (40)** |
| 9 | 22 | Exception Handling contd: handing exception based on practical problem scenario. | " | CO4 | |
| | 23 | Multithreaded Programming: multitasking, Main thread | ch11 | CO2 | |
| | 24 | Multithreaded Programming contd: Creating a thread, lifecycle of a thread | " | CO2 | |
| 10 | 25 | Multithreaded Programming contd: creating multiple threads, thread methods: stop(), resume(), suspend(), wait(), notify (), and notifyAll(). | " | CO3 | |
| | 26 | Multithreaded Programming contd: thread priorities, synchronization, Inter-Thread communication | " | CO4 | |
| | 27 | Multithreaded Programming contd: synchronization, Inter-Thread communication | " | CO4 | |
| 11 | 28 | Multithreaded Programming contd: implementation of thread based problem. | " | CO4 | |
| | 29 | String Handling: Special string operations, character extraction, string comparison, modifying string, other string operations | ch15 **[CT2** | CO2 | |
| | 30 | String Handling contd: practical problem solving based on string manipulations. | " | CO3 | |
| 12 | 31 | Java Collections Framework: Basics, Collection interface, set interface, Arraylist class, linkedlist class | ch17 | CO2 | |
| | 32 | Java Collections Framework contd: list interface, queue interface. | " | CO2 | |
| | 33 | Java Collections Framework contd: Priority queue class, Map class, Map interface | " | CO3 | |
| 13 | 34 | Java Collections: practical problem design solutions. | " | CO3 | |
| | 35 | File Input/Output: Exploring java.io, FileInputStream, FileOutputStream, ByteArrayInputStream, ByteArrayOutputStream, | ch19 | CO2 | |
| | 36 | File Input/Output contd: The Stream Classes: DataOutputStream and DataInputStream, RandomAccessFile | " | CO3 | |
| 14 | 37 | The Character Streams: serialization, BufferedReader, BufferedWriter, | " | CO3 | |
| | 38 | File Input/Output: practical problem solving. | " | CO4 | |
| | 39 | **Review class for Semester Final Examination** | | | |
| 15 | **Semester Final Examination** | | | | |

## Descriptions of Cognitive Domain (Anderson and Krathwohl's Taxonomy 2001):

The **cognitive domain** involves the development of our mental skills and the acquisition of knowledge.

| Level | Category | Meaning | Keywords |
|---|---|---|---|
| C1 | Remembering | Recognizing or recalling knowledge from memory. Remembering is when memory is used to produce or retrieve definitions, facts, or lists, or to recite previously learned information. | Define, describe, draw, find, identify, label, list, match, name, quote, recall, recite, tell, write |
| C2 | Understanding | Constructing meaning from different types of functions be they written or graphic messages or activities like interpreting, exemplifying, classifying, summarizing, inferring, comparing, or explaining. | Classify, compare, exemplify, conclude, demonstrate, discuss, explain, identify, illustrate, interpret, paraphrase, predict, report |
| C3 | Applying | Carrying out or using a procedure through executing, or implementing. Applying relates to or refers to situations where learned material is used through products like models, presentations, interviews or simulations. | Apply, change, choose, compute, dramatize, implement, interview, prepare, produce, role play, select, show, transfer, use |
| C4 | Analyzing | Breaking materials or concepts into parts, determining how the parts relate to one another or how they interrelate, or how the parts relate to an overall structure or purpose. Mental actions included in this function are differentiating, organizing, and attributing, as well as being able to distinguish between the components or parts. When one is analyzing, he/she can illustrate this mental function by creating spreadsheets, surveys, charts, or diagrams, or graphic representations. | Analyze, characterize, classify, compare, contrast, debate, deconstruct, deduce, differentiate, discriminate, distinguish, examine, organize, outline, relate, research, separate, structure |
| C5 | Evaluating | Making judgments based on criteria and standards through checking and critiquing. Critiques, recommendations, and reports are some of the products that can be created to demonstrate the processes of evaluation. | Appraise, argue, assess, choose, conclude, critique, decide, evaluate, judge, justify, predict, prioritize, prove, rank, rate, select, monitor |
| C6 | Creating | Putting elements together to form a coherent or functional whole; reorganizing elements into a new pattern or structure through generating, planning, or producing. Creating requires users to put parts together in a new way, or synthesize parts into something new and different creating a new form or product. This process is the most difficult mental function. | Construct, design, develop, generate, hypothesize, invent, plan, produce, compose, create, make, perform, plan, produce |

## Teaching Materials/Equipment

**Required References**: 1. Java: The Complete Reference, 7th Edition, by Herbert Schildt

**Recommended References**: 1. Java: How to Program, 9th Edition, by Harvey Deitel & Paul Deitel

2. Programming with Java: A Primer, 3rd Edition, E. Balagurusamy

## Overall CO Assessment Scheme

| Assessment Area | CO | | | | Assessment Area Mark |
|---|---|---|---|---|---|
| | CO1 | CO2 | CO3 | CO4 | |
| Class Participation | | | | | |
| Assignment/Presentation | | | | | |
| Class Test | | | | | |
| Midterm Exam | 10 | 10 | 10 | | 30 |
| Final Exam | | 10 | 20 | 10 | 40 |
| **Total Mark** | **10** | **20** | **30** | **10** | **70** |

## Grading System

| Numerical Grade | Letter Grade | | Grade Pont |
|---|---|---|---|
| 80% and above | A+ | (A Plus) | 4.00 |
| 75% to less than 80% | A | (A Regular) | 3.75 |
| 70% to less than 75% | A- | (A Minus) | 3.50 |
| 65% to less than 70% | B+ | (B Plus) | 3.25 |
| 60% to less than 65% | B | (B Regular) | 3.00 |
| 55% to less than 60% | B- | (B Minus) | 2.75 |
| 50% to less than 55% | C+ | (C Plus) | 2.50 |
| 45% to less than 50% | C | (C Regular) | 2.25 |
| 40% to less than 45% | D | | 2.00 |
| Less than 40% | F | | 0.00 |

## Instructor Information

**Instructor** : **Md. Anwar Hussen Wadud**
Lecturer,
Department of CSE, BUBT

**Office** : Room No-503 (Building-3)

**Phone** : 01741585687

**Email** : mwadud@bubt.edu.bd

## Class Schedule

| Day | Time | Room No |
|---|---|---|
| Monday | 10:00 AM – 11:20 AM | 318 |
| Thursday | 10:00 AM – 11:20 AM | 218 |

## Office Hours

| DAYS | 8:30-09:30 | 09:35-10:35 | 10:40-11:40 | 11:45-12:45 | 12:45-01:15 | 01:15-02:15 | 02:20-03:20 | 03:25-04:25 | 04.30-05:30 | 06.00-07:30 | 07:45-09:15 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| SAT | | | | | | | | | | | |
| SUN | | | Office Hour | | | Office Hour | | | | | |
| MON | | | Office Hour | Office Hour | | Office Hour | | | | | |
| TUE | | | | Office Hour | | | | Office Hour | | | |
| WED | | | | | | | | | | | |
| THU | | Office Hour | Office Hour | Office Hour | | | | | | | |
| FRI | | | | | | | 03.00 PM – 06.00PM | | | 06.00 PM – 09.00PM | |

## Special Instructions

- Students are expected to attend all classes and examinations. A student MUST have at least 50% class attendance to sit for the final exam.
- Students will not be allowed to enter into the classroom after 20 minutes of the starting time.
- For plagiarism, the grade will automatically become zero for that exam/assignment.
- All mobile phones MUST be turned to silent mode during class and exam period.
- There is zero tolerance for cheating in exam. The only penalty for cheating is expulsion for several semesters as decided by the Disciplinary Committee of the university.

**Prepared by:** **Checked by:** **Approved by:**