Bangladesh University of Business and Technology (BUBT)
Faculty of Engineering & Applied Sciences (FEAS)
Department of Computer Science and Engineering (CSE)

Program: B.Sc. Engg. in Computer Science and Engineering	**Session:** Spring 2024	**Level-Term:** L3-T1
Course Code: 0611-341	**Course Title:** Advanced Programming	**Credit Value:** 3
Course Type: Core Course	**Credit Hours:** 3.00	**Prerequisite:** 0613-221	**Total Marks:** 100

COURSE TEACHER:

Name	:	Humayra Ferdous	**Classroom Code**	:	a3eq7b2
Designation	:	Lecturer	**Contact:**	:	+8801751948092
Email	:	humayra@bubt.edu.bd	**Specialization:**	:	Artificial Intelligence, Machine Learning, Data mining.

CLASS SCHEDULE:

Class Day	Class Hours	Room
Sunday	10.30 am – 11.45 am	B2/319
Tuesday	11.45 am – 01.00 pm	B2/320

COUNSELING HOURS:

Day	Counseling Hours	Room
Monday	09.15 am – 10.30 am	B1/303
Tuesday	10.30 am – 11.45 am	B1/303
Wednesday	01.30 pm – 02.45 pm	B1/303

Course Rationale	This course has been designed to teach the students the fundamental concepts of the 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 the advanced object-oriented problem using the exclusive features of Java.
Course Objectives	The purpose of this course is to impart a solid understanding of the fundamental principles behind the Java programming language to students. It places a strong emphasis on instructing them in crafting programs using the distinctive attributes of Java, including Object-Oriented Programming (OOP), interfaces, packages, multithreaded programming, exception handling, and the collection framework. The course highlights the importance of enabling students to adeptly formulate appropriate logic for solving complex object-oriented challenges by leveraging the unique capabilities inherent in Java's feature set.
Course Outcomes (COs)	Upon completing this course students will be able to: **CLO1: Understand** the fundamentals of OOP features alongside basic programming concepts in java. **CLO2: Explain** exclusive features of java containing in OOP model, exceptions, multithreading, generic collections, files, etc. **CLO3: Design** solutions of different problems by applying OOP and java's features. **CLO4: Analyze** real life problem scenario and produce robust solution using java's advanced functionalities.

COs to POs Mapping

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

CO	PO	Bloom's Domain / Level	Delivery Methods / Activities	Assessment Tools
CO1	PO1	Cognitive/Understanding	Class Lecture & Discussion	Midterm
CO2	PO1	Cognitive/Understanding	Class Lecture & Discussion	Midterm & Final
CO3	PO2	Cognitive/Analyzing	Class Lecture & Problem Solving	Midterm & Final
CO4	PO3	Cognitive/Applying	Problem Solving	Midterm & Final

LECTURE PLAN (WEEKLY SCHEDULE)

Week	Selected Topics	Teaching Learning Strategy	Assessment Strategy	Corresponding CLOs
1-2 (Week 1)	History and evolution of Java: The Java Technology Phenomenon, OOP Programming Concepts, benefits of OOP, applications of OOP	Lecture, Video Presentation	Class Test, Assignment, Written Examination	CO1
3-4 (Week 2)	Getting started with java program: simple java applications, compiling a program, and executing applications, Variables, Primitive Data Types, Arrays, Operators: Assignment, Relational, Unary, Arithmetic, Conditional and others	Lecture discussion with White Board and Multimedia, Problem Solving		CO1
5-6 (Week 3)	Control statements: if-else, switch, for, while, do-while, for each loop, jump statements, Class fundamentals, declaring objects, introducing methods, Constructors, this keyword, garbage collection			CO2
7-8 (Week 4)	Method overloading, constructors overloading, using object as parameters, argument passing, returning objects, Introducing access control, understanding static, introducing final			CO2
9-10 (Week 5)	Introducing nested and inner classes, String class, Using command line arguments, Inheritance basics and practical example, Using super			CO3
11-12 (Week 6)	Multilevel hierarchy, method overriding, Dynamic method dispatch, Abstract Class, using final with inheritance			CO3
13-14 (Week 7)	Interface Basics, implementing interface, nested interface, Applying interface, variables in interface, extending interface, Packages and Interfaces: Packages, importing package, Defining and Implementing an Interface	Lectures, Questions and answers	Problem Solving & Viva Voce	CO2
Midterm Examination (27 Aug – 12 Sep 2023)				

15-16 (Week 8)	Exception Handling: fundamentals, Exception types, Uncaught exceptions, using try and catch, multiple catch clause, nested try statements, finally block	Lecture discussion with White Board and Multimedia, Problem Solving	Class Test, Assignment, Problem Solving Ability and Written Examination	CO2
17-18 (Week 9)	Exception Handling: Throwing Exceptions, Java built in exceptions, custom exception, handing exception based on practical problem scenario			CO3, CO4
19-20 (Week 10)	Multithreaded Programming: multitasking, Main thread, Creating a thread, life cycle of a thread			CO2
21-22 (Week 11)	Multithreaded Programming: creating multiple threads, thread methods: stop(), resume(), suspend(), wait(), notify (), and notifyAll(),thread priorities, synchronization,Inter-Thread communication, synchronization, Inter- Thread communication, implementation of thread based problem			CO3
23-24 (Week 12)	String Handling: Special string operations, character extraction, string comparison, modifying string, other string operations, practical problem solving based on string manipulations			CO2
25-26 (Week 13)	Java Collections Framework: Basics, Collection interface, set interface, Arraylist class, linkedlist class, list interface, queue interface, Priority queue class, Map class, Map interface, practical problem design solutions			CO2, CO3
27-28 (Week 14)	File Input/Output: Exploring java.io, FileInputStream, FileOutputStream, ByteArrayInputStream, ByteArrayOutputStream The Stream Classes: DataOutputStream and DataInputStream, RandomAccessFile	Discussion and Problem Solving	Problem Solving Ability and Written Examination	CO2, CO3
27-28 (Week 15)	The Character Streams: serialization, BufferedReader, BufferedWriter			CO3
27-28 (Week 16)	File Input/Output: practical problem solving, **Review class for Semester Final Examination**	Lectures, Questions and answers	Problem Solving & Viva Voce	CO4
Final Exam (19 Nov -04 Dec 2023)				

Teaching Strategy	Maximum topics will be covered from the textbook. For the rest of the topics, reference books will be followed. Some class notes will be uploaded on the web. White board will be used for most of the time. Multimedia projector and a PC will be used for the convenience of the students to understand codes practically. Students must participate in classroom discussions for case studies, problems solving and project developments.

Assessment and Marks Distribution

Continuous	Class Participation	10%
	Assignment / Presentation	10%
	Class Test	10%
Summative	Midterm Examination	30%
	Final Examination	40%

Grading Policy

A+	≥ 80
A	75 - < 80
A-	70 - < 75
B+	65 - < 70
B	60 - < 65
B-	55 - < 60
C+	50 - < 55
C	45 - < 50
D	40 - < 45
F	< 40

Additional Information

1. Academic Calendar: https://www.bubt.edu.bd/Home/page_details/Academic_Calender
2. Rules & Regulations: https://www.bubt.edu.bd/Home/page_details/Rules_and_Regulations
3. Grading & Evaluation: https://www.bubt.edu.bd/Home/page_details/Evaluation_Grading_System
4. Proctorial Rules: https://www.bubt.edu.bd/Home/page_details/Office_of_the_Proctor

Overall CO Assessment Criteria

Assessment methods of COs are given below:

Assessment Area	CO				
	CO1	CO2	CO3	CO	
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**

Additional Course Policies

There will be assignments. No late assignments will be accepted. ***Any kind of copy/manipulation in assignments will carry zero mark.*** Two or more copied assignments will carry zero mark in all assignments. **Zero tolerance will be shown in this regard.** Solutions to assignment problems will be provided through web and on hand.

There will be at least three class tests (CT). Best two of three or best three CTs will be counted. Both of regular and surprise CTs can be conducted.

CT, Mid-term and final exam will be closed book, closed notes. Mobile phone is strictly prohibited in exam hall. Students are insisted to carry their own watch and synchronize time during exam hours.

If a student is absent from class test anyway and made no report to the class teacher personally beforehand, his/her score for that test will be zero. No make-up for the class test will be allowed as 2 of 3 CTs are being considered. No make-up for Mid-exam will be entertained without physical presence and recommendation of the guardian along with written permission of the department. Make-up of Mid-exam may be much harder than the regular one.

Rubrics

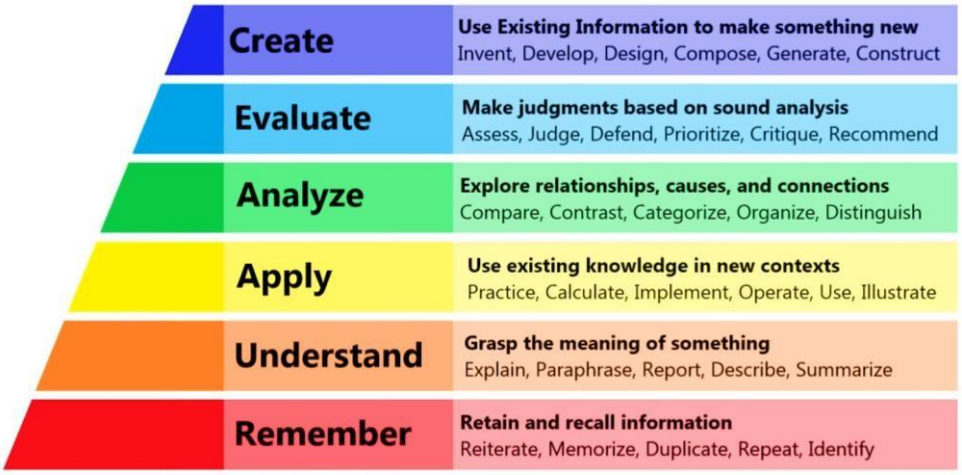
COs (Bloom's Level)	Excellent (80%-100%)	Good (70%-79%)	Satisfactory (60%-69%)	Poor (40%-59%)	Unsatisfactory (0-39%)	Marks (70)
CO1 Understanding	Answer is complete and sufficient detail provided to support issues related to the question. And also deals fully with the entire question.	Answer is brief with sufficient detail provided to support issues were introduced. And most of the basic details are included but some are missing.	Answer is brief with insufficient detail provided to support issues were introduced.	Answer is incomplete and excessive discussion of unrelated issues. And serious gaps in the basic details.	None of the relevant details were included or didn't answer.	**10**

CO2 Understanding	The question is answered appropriately explaining the problem solving strategy to a specific programming problem described in the question.	The question is answered briefly explaining the problem solving strategy to a specific programming problem described in the question.	The question is answered correctly by the problem solving strategy to a specific programming problem described in the question but some points are missing.	The question is answered incompletely explaining the problem solving strategy to a specific programming problem described in the question but some points are correct.	No attempt to explain the problem solving strategy to a specific programming problem described in the question method.	**20**
CO3 Analyzing	A clear, complete, and properly ordered chain of analyzing steps (i.e. perceive the problem scenario, relate the problem to the programming perception, explore the programming strategy to solve it) is followed to answer the question.	The chain of analyzing steps is complete and correctly ordered but lack of some expected plods.	One or more intermediate analyzing steps are missing or unclear, but the correctness of the analysis is not compromised.	One or more intermediate analyzing steps are missing or unclear to answer the question.	The stated chain of analysis does not lead to the stated question.	**20**
CO4 Applying	The answer shows the complete and appropriate application of conceptual programming strategies to solve a problem.	The answer shows appropriate application of conceptual programming strategies incompletely to solve a problem.	The answer shows partially appropriate but complete application of conceptual programming strategies to solve a problem.	The answer shows partially appropriate application of conceptual programming strategies incompletely to solve a problem.	The answer shows the incomplete and inappropriate application of conceptual programming strategies to solve a problem.	**20**

Text Book	Java: The Complete Reference, 7th Edition, by Herbert Schildt
Reference Book	**1.** Java: How to Program, 9th Edition, by Harvey Deitel & Paul Deitel **2.** Programming with Java: A Primer, 3rd Edition, E. Balagurusamy

Bloom's Taxonomy for Teaching-Learning

Bloom's Taxonomy is a set of three hierarchical models used to classify educational learning objectives into levels of complexity and specificity. The three lists cover the learning objectives in Cognitive, Affective and Psychomotor domains. The Cognitive domain list has been the primary focus of most education and is frequently used to structure curriculum learning objectives, assessments and activities. The three domains and respective levels are illustrated below.



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 somethingnew 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

Graduate Attributes (Program Outcomes) for B.Sc. in Engineering Program based on Washington Accord

Program Outcomes (POs) are narrower statements that describe what students are expected to know and be able to do by the Time of graduation. These relate to the knowledge skills and attitudes that students acquire while progressing through the program. The students of the B.Sc. in CSE program are expected to achieve the following graduate attributes or program outcomes at the time of graduation.

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.

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