

**Maulana Abul Kalam Azad University of Technology, WB**  
**(Formerly known as West Bengal University of Technology)**  
**Syllabus of B.Sc. in Computer Science**  
**Effective from academic session 2023-24**  
**Semester-IV**

**Paper Name: Object Oriented Programming Using JAVA/ OOP using JAVA Laboratory**

**Code: CS 401 / CS 491**

**Contact: 3L+2P**

**Credit:3+2**

**Course Objectives:**

- CO1. To understand the concept of Class, Data, Polymorphism, Inheritance, Dynamic Binding
- CO2. To understand the concept of Overview of JAVA
- CO3. To understand the different types of natural Data type, Variable and Constants token in JAVA
- CO4. To understand the concept of Control Statement of JAVA
- CO5. To understand the Iteration Statement, Arrays and Vector, Classes and Objects, Inheritance.
- CO6. To understand Packages, Interfaces, Exception Handling, Multithreaded Programming, Applets, Abstract Window Toolkit

**Module I: Oops Concept**

Object, Class, Data abstraction, Data encapsulation, Inheritance, Polymorphism, Dynamic including

**Module II: An overview of Java**

Java features, JVM, Comparison between Java and C++, Idea of any Java Development Kit (JDK), learn to run javaprogram through command line and with any JDK

**Module III: Data Concept**

Data Types, variables and constants Tokens in Java (Identifiers, Literals, Keywords, Operator)

**Module IV: Control Statements**

Simple if statement, if...else statement, Nesting of if-else statement, switch statement

**Module V: Iteration Statement**

For loop, While loop, Do-While loop

**Module VI: Arrays and Vector**

1D and 2D array, vector concepts

**Module VII: Classes and Objects**

Creating main() in a separate class, Methods with parameters, Methods with a return type, Method overloading, Passing Objects as Parameters, Passing Values to methods and Constructor, Abstract classes

**Module VIII: Inheritance**

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Basic concepts, types of inheritance, use of super keyword, overriding methods.

**Module X: Packages, Interfaces**

User defined package, import package, Class path, How to create interface, use and extend interface

**Module XI: Exception Handling**

Overview, What is Exceptions and handling exception?, Compile time errors Run time errors, try...catch, Using Multiple catch Blocks, finally Block, Throwing an Exception, Using the throw and throws Statement.

**Module XII: Stream**

Byte Streams, Input Stream, Output Stream Character Streams (Reader, Writer), How Files and Streams Work, Working with Reader classes (Input Stream Reader, Buffered Reader)

**Module XIII: Multithreaded Programming**

Overview, Thread Life cycle, Advantages of multithreading over multi-tasking Thread Creation and simple programs, Synchronized threads, Synchronized Methods

**Module XIV: Applets**

Applet vs. Application, Applet class, Advantages of Applet, Applet Lifecycle My First Applet, Applet tag, How to run applet

**Module XV: Abstract Window Toolkit**

GUI Components, Interface and Classes of AWT Package, Labels, Buttons, Check Boxes, Radio button, Text Area, TextField, Scrollbar, Panels, Layout managers, Simple event driven programming with Text Field and Button

**OOP using JAVA Laboratory:**

Practical: Based on Theory

**Reference Books:**

1. Let Us JAVA 2 Edition, Yashavant Kanetkar BPB Publications
2. Programming with JAVA 5th Edition, E Balagurusamy, TMH
3. Core JAVA, Tanweer Alam, Khanna Publishing House

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**Paper Name: Data Communication and Computer Networks**

**Code: CS 402**

**Contacts: 3L + 1T**

**Credit:4**

**Course Objectives:**

CO1. Build an understanding of the fundamental concepts of computer networking.

CO2. Familiarize the student with the basic taxonomy and terminology of the computer networking area.

CO3. Introduce the student to advanced networking concepts, preparing the student for entry Advanced courses in computer networking.

CO4. Allow the student to gain expertise in some specific areas of networking such as the design and maintenance of individual networks.

<b>Unit</b>	<b>Content</b>
1	<p><b>Introduction:</b></p> <p>Data communications Components, data representation, direction of data flow (simplex, half duplex, full duplex).</p> <p><b>Network Hardware:</b> Physical structure (type of connection, topology), categories of network (LAN, MAN, WAN).</p> <p><b>Internet:</b> Brief history, Protocols and standards, <b>Reference models:</b> OSI reference model, properties of all the layers, TCP/IP reference model, their comparative study.</p>
2	<p><b>Physical Layer</b></p> <p><b>Data &amp; Signals:</b> Analog &amp; Digital Data and Signals, periodic and non-periodic signals, composite signals, bandwidth, bit rate, transmission of digital signals.</p> <p><b>Transmission Impairments:</b> Attenuation, Distortion and Noise.</p> <p><b>Data Rate Limits:</b> Noiseless Channel: Nyquist Data rate, Noisy Channel: Shannon's Capacity, calculation of data rate using both limits.</p> <p><b>Digital Transmission</b></p> <p><b>Digital to Digital Conversion:</b> Line coding, schemes (RZ, NRZ, Manchester, Differential Manchester), block coding.</p> <p><b>Analog to Digital Conversion:</b> Sampling, Nyquist rate of sampling, Pulse code</p>

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modulation (PCM), Delta Modulation (DM), Adaptive Delta Modulation (ADM), parallel and serial transmission.

**Analog Transmission**

**Digital to Analog:** Amplitude shift keying (ASK), Frequency Shift Keying (FSK), Phase Shift Keying (PSK), Quadrature Amplitude Modulation (QAM).

**Analog to Analog Conversion:**

Amplitude Modulation (AM), Frequency Modulation (FM), Phase Modulation.

**Bandwidth Utilization Techniques**

**Multiplexing:** FDM, Synchronous & Statistical TDM, WDM.

**Transmission Medium**

**Guided media:** Twisted pair, Coaxial, Fiber optics.

**Unguided:** Radio waves, microwaves, Infrared, Antenna, Communication satellites

**Switching and Telephone network**

Circuit switched networks, Packet Switched networks, Virtual Circuit switch.

Major components of telephone network, Dial up modem, DSL and ADSL modems, Cable

TV for data transfer

3

**Data link Layer:**

Types of errors, framing (character and bit stuffing), error detection & correction methods, Linear and cyclic codes, checksum.

**Protocols:** Stop & wait ARQ, Go-Back- N ARQ, Selective repeat ARQ, HDLC.

**Physical addressing:** MAC address and its format.

**Medium Access sub layer**

Point to Point Protocol, Token Ring: Reservation, Polling. **Multiple access protocols:**

Pure & Slotted ALOHA, CSMA, CSMA/CD, CSMA/CA.

**Channelization:** FDMA, TDMA, CDMA.

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**Wired and Wireless LAN:** Standards, fast Ethernet, Protocol 802.11, Bluetooth.

4      **Network layer**

**Internetworking & devices:** Repeaters, Hubs, Bridges, Switches, Router, Gateway,

**Addressing:** IP addressing, Subnetting, **Routing techniques:** static vs. dynamic routing

,

**Protocols:** RARP, ARP, IP, ICMP

5      **Transport layer**

**Process** to Process delivery: UDP, TCP

6      **Application Layer**

Introduction to DNS, Remote logging, FTP, Electronic mail, WWW & HTTP

**Textbook and Reference books:**

1. Data Communication and Networking, B.A. Forouzan, Tata McGraw Hill.
2. Computer Networks, A.S. Tanenbaum, Pearson Education.
3. Data and Computer Communication, W. Stallings, Pearson Education.
4. Data & Computer Communication, Black, PHI.
5. Internet & World Wide Web: How to Program, Harvey M. Deitel & Paul J. Deitel.

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**Paper Name: Software Engineering**

**Code: CS 403**

**Contacts: 3L + 1T**

**Credit:4**

**Course Objectives:**

CO1. Be successful professionals in the field with solid fundamental knowledge of software engineering

CO2. Utilize and exhibit strong communication and interpersonal skills, as well as professional and ethical principles when functioning as members and leaders of multi-disciplinary teams

CO3. Apply their foundations in software engineering

Unit	Content
1	<b>Introduction</b>  Defining system, open and closed system, modeling of system through computer hardware, communication systems, external agents and software systems; Importance of Engineering Methodology towards computerization of a system.
2	<b>Software Life Cycle</b>  Classical and Iterative Waterfall Model; Spiral Model; Prototype Model; Evolutionary model and its importance towards application for different system representations, Comparative Studies.
3	<b>Software Requirement and Specification Analysis</b>  Requirements Principles and its analysis principles; Specification Principles and its representations  Software Design Analysis – Different level of DFD Design, Physical and Logical DFD, Use and Conversions between them, Decision Tables and Trees, Structured analysis, Coupling and Cohesion of different modules  Software Cost Estimation Modeling –COCOMO.
4	<b>Software Testing</b>  Software Verification and Validation; Testing objectives, Testing Principles, Testability; Error and Faults; Unit Testing, White Box and Blank Box Testing, Test Case Design: Test Vector, Test Stub.

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**Software Quality Assurances**

Concepts of Quality, Quality Control, Quality Assurance, IEEE Standard for Statistical

Software Quality Assurances (SSQA) criterions.

**Textbook and Reference books:**

1. Software Engineering: A Practitioner's Approach by R.S. Pressman, McGraw-Hill.
2. An Integrated Approach to Software Engineering by P. Jalote, Narosa Publishing House.
3. Software Engineering by Nasib Singh Gill, Khanna Publishing House.
4. Software Engineering by I. Sommerville, Addison Wesley.
5. Software Engineering for Students by D. Bell, Addison-Wesley.
6. Fundamentals of Software Engineering by R. Mall, PHI.
7. Software Engineering by K.K. Agarwal, Newage International.