West Bengal Council of Higher Secondary Education

Vidyasagar Bhavan

9/2, Block DJ, Sector-II, Salt Lake, Kolkata – 91

No : L/PR/ 012 /25 **Date : 11.01.2025**

Notification

Attention : All Concerned

In an earlier Notification vide Memo No. L/PR/454/24 dted 13.12.2024, the Council has already published the revised syllabus in the following subjects :
English B, English A, Alternative English, Bengali A, Hindi A, Hindi B, History, Political Science, Accountancy, Costing & Taxation, Business Studies, Education, Science of Well-being, Statistics, Philosophy, Environmental Studies, Economics. Geography, Biological Science.

In this Notification, the revised syllabus of Modern Computer Application [COMA] is being published.

- **All the changes in the concerned subjects will get reflected in the 4th Edition of the syllabus book.**
- **Relevant changes will be made in our next version of the books of Model Question papers.**
- **Please note that, changes as stated in the Class XI syllabus in this Notification are not going to affect the students who are already in the process of preparation for the Class XI Semester 2 examination.**
- **Any changes mentioned here in this Notification will be effective from the next academic year.**

11/01/2025

Dr.(Prof) Chiranjib Bhattacharjee
PRESIDENT
(WBCHSE)

WEST BENGAL COUNCIL OF HIGHER SECONDARY EDUCATION
SYLLABUS FOR CLASSES XI AND XII

SUBJECT : MODERN COMPUTER APPLICATION (COMA)

COMA

Course Overview:

This course covers the fundamental concepts of computer system organization, programming, efficient mechanism for storing and retrieving data on main memory, data management and visualization techniques, computer networks along with HTML page designing, the value of technology in societies, e-commerce, database management system, artificial intelligence, and data warehouse and data mining technique for the students from all academic backgrounds.

Course Objective:

This course enables students to-

- develop an understanding of how computer system works; the components of computer systems and how they interrelate, including software, data, hardware, communications and users.
- analyze a computing problem and to apply principles of computing to identify solutions.
- use of efficient data storing and retrieval technique along with basic programming skill.
- gather the fundamental knowledge on computer networks and web page designing.
- gain proficiency in data management, visualization, analysis, and presentation using a widely-used open source spreadsheet software application such as Open Office, Libre Office, or Google Spreadsheets.
- appreciate the ethical implications relating to the use of computing technology and information and identify the impact of technology on personal life and society.
- develop the knowledge, skills, and competencies needed to leverage the opportunities presented by the digital economy and to navigate the challenges and risks associated with online business operations.
- understand the basics of artificial intelligence and its subfields.
- develop an understanding of database management systems, with an emphasis on how to organize, maintain and retrieve - efficiently, and effectively.
- extract knowledge from data repository for data analysis, frequent pattern, classification and prediction.

Class XI

Total Contact Hours: 200 (Theory & Practical: 180 ; Remedial & Home Assignment:20)

SEMESTER – I

Course Code: COMA (Theory)

Full Marks: 35 **Contact Hours: 100**

Unit – 1	**Computer System and Organisation** **15 Marks**	**Total 30 Hours**
	• Basic Computer Organisation ➢ CPU, Primary Memory (RAM, ROM, Cache), Secondary storage device, I/O devices, units of memory (bit, byte, KB, MB, GB, TB, PB). • Classification of Computers ➢ Super, Mainframe, Mini, PC.	**4 Hours**
	• Concepts of Software ➢ Definition of software, types of software – System Software (Translator: assembler, interpreter, compiler, Loader, Linker, Operating System: Definition and functions, types of OS- Single use, Multiuse, Multiprogramming, Multiprocessing, Time sharing), Application Software (Definition and example), Utility Software, concept of GUI and CUI with examples using LINUX (Basic Commands).	**7 Hours**
	• Number System ➢ Binary, Octal, Decimal, Hexadecimal number system, conversion between number system, Weighted Code (BCD, Binary, 84-2-1 code), non-weighted code (GREY, Excess-3), encoding schemes (ASCII, ISCII, uni code), 1's complement, 2's complement.	**9 Hours**
	• Boolean Algebra ➢ Postulates, logic gates: NOT, AND, OR, NAND, XOR, NOR, XNOR, truth tables,De Morgan theorem, SOP, POS, Simplifications using KMap and Boolean algebra, logic circuits.	**10 Hours**
Unit – 2	**Programming Fundamentals** **10 Marks**	**Total 20 Hours**
	• Concept of Programming ➢ Instruction (Definition, Example), Program (definition, example), Programming Language (concept of high level, low level and assembly language), Procedural and Non-procedural programming, Concept of Structured Programming, Object Oriented Programming.	**2 Hours**
	• Algorithm fundamentals ➢ Definition, characteristic of algorithm, recursive and non-recursive algorithms, representation of algorithm using flowchart, pseudo code.	**15 Hours**

	• Introduction to Problem Solving ➢ Steps for Problem Solving (analysing the problem, developing an algorithm, coding, testing, debugging).	**3 Hours**
Unit – 3	**Data Visualization using Spreadsheet** **10 Marks**	**Total 50 Hours**
	• Introduction to Spreadsheets ➢ Spreadsheets and their applications, overview of spreadsheet software (e.g., Open office, Google Sheets, Excel), creating workbooks, modifying workbook, zooming in on a worksheet, arranging multiple workbook windows, adding buttons to the quick access toolbar, customizing the ribbon, maximizing usable space in the program window navigating the spreadsheet interface, entering and editing data in cells saving, opening, and closing spreadsheet files.	**6 Hours**
	• Working with Data and Tables ➢ Entering and revising data, moving data within a workbook, finding and replacing data, correcting and expanding upon worksheet data, defining tables.	**5 Hours**
	• Performing Calculations on Data ➢ Naming groups of data, creating formulas to calculate values (e.g., SUM, AVERAGE, COUNT), summarizing data that meets specific conditions (e.g., AVERAGEIF, COUNTA, COUNTBLANK, COUNTIFS, SUMIF, IFERROR etc), finding and correcting errors in calculations.	**5 Hours**
	• Changing Workbook Appearance ➢ Formatting Cells, defining styles, workbook themes and table styles, making numbers easier to read, changing the appearance of data based on its value, adding images to worksheets.	**4 Hours**
	• Data Analysis and Manipulation ➢ Limiting data appearance on screen, working with text functions for data cleaning, Splitting and combining data, Data normalization and standardization, working with ranges and named ranges, conditional formatting, data validation and error checking, using logical functions (e.g., IF, AND, OR), sorting and filtering data.	**10 Hours**
	• Advanced Spreadsheet Features ➢ Creating and managing tables, working with charts and graphs.	**10 Hours**
	• Reporting and Presentation of Results ➢ Designing informative reports and summaries, creating interactive dashboards for data presentation, data visualization best practices, documenting data analysis processes presenting findings to stake holders.	**8 Hours**
	• Collaboration and Sharing ➢ Protecting worksheets and workbooks, sharing spreadsheets with others, tracking changes and commenting,	**2 Hours**

SEMESTER – II

Course Code: COMA (Theory)

Full Marks: 35 **Contact Hours: 80**

Unit – 1	**Data Structure** **10 Marks**	**Total 30 Hours**
	• Definition, types of data structure-linear and non-linear.	**2 Hours**
	• Arrays: 1D, 2D and their applications.	**3 Hours**
	• Linked List: Basic concepts of Single, circular and double link list.	**6 Hours**
	• Stack ➢ Stack operations (push and pop), applications of Stack.	**4 Hours**
	• Queue ➢ Queue operations, applications of queue, basic concepts of circular queue and priority queue.	**4 Hours**
	• Recursion ➢ Definition. ➢ Advantages and limitations of recursion.	**4 Hours**
	• Searching and Sorting ➢ Linear Search, Binary Search, and their comparison. ➢ Bubble Sort and its Implementation.	**7 Hours**
Unit – 2	**Computer Networks** **15 Marks**	**Total 35 Hours**
	>Introduction to Networking >>Analogue and digital Communication >>Mode of Communication- Simplex, half duplex and full duplex >>Network Architecture- Client server, Peer to Peer >>Serial and Parallel Communication >>Measuring Capacity of Communication Media (bandwidth, channel capacity, baud) >>Synchronous and asynchronous Transmission Mode >>Baseband and Broadband network.	**6 Hours**
	>Transmission Media >>Wired Communication Media (Twisted Pair, Co-axial cable, Fiber Optic). >>Wireless Communication Media (Radio wave, Microwave, Infrared, Satellite).	**3 Hours**
	>Network Connecting Devices >>Modem, Ethernet Card, RJ45, Repeater, Hub, Switch, Router, Gateway, Wifi card.	**2 Hours**
	>Network Type and Topologies >>Types of Network-LAN, MAN, WAN. >>Network Topologies- Bus, Star, Ring, Tree.	**3 Hours**

	>Network Protocols -HTTP, FTP, PPP, SMTP, TCP/IP, POP3, TELNET, HTTPS, VoIP.	**2 Hours**
	>Referential Model- OSI Model (Basic Concept, use of devices and protocols at different layers).	**1 Hours**
	>Introduction to Web Services: WWW, HTML, XML, IP Addresses, Domain names, URL, ISP, Website, Web browser, Web Server, Web Hosting.	**3 Hours**
	>HTML Basic Tags and Document structure, HTML Tags, Head Tags, Title Tags, Introduction to HTML and Web design, how to create simple Web page, how to format text, Create Table, Adding Web link and Images, Forms, adding styles and classes to web pages, Borders and Background, Adding Video and Graphics.	**15 hours**
Unit – 3	**Ethics** **10 Marks**	**Total 15 Hours**
	• **Digital Footprints.**	**1 Hour**
	• **Data Protection:** Intellectual property rights (copyright, patent, trademark), violation of IPR (plagiarism, copyright infringement, trademark infringement), open-source software and licensing (Creative Commons, GPL and Apache).	**5 Hours**
	• **Cyber Crime:** Definition, hacking, eavesdropping, phishing and fraud emails, ransomware, cyber trolls, cyber bullying.	**3 Hours**
	• **Cyber safety:** Safely browsing the web, identity protection, confidentiality.	**2 Hours**
	• **Malware:** Viruses, trojans, adware.	**1 Hour**
	• **E-waste management:** Proper disposal of used electronic gadgets.	**2 Hours**
	• **Information Technology Act:** (IT Act).	**1 Hour**

Class XII

Total Contact Hours: 200 (Theory & Practical: 180 ; Remedial & Home Assignment:20)

SEMESTER – III

Course Code: COMA(Theory)

Full Marks: 35 **Contact Hours: 100**

Unit – 1	**Python Programming** **25 Marks**	**Total 80 Hours**
	• **Familiarization with the basics of Python programming** ➢ Introduction to Python, Features of Python, executing a simple "hello world" program, execution modes: interactive mode and script mode, Python character set, Python tokens (keyword, identifier, literal, operator, punctuator), variables, concept of l-value and r - value, use of comments.	**4 Hours**
	• **Knowledge of data types** ➢ Number (integer, floating point, complex), Boolean, sequence (string, list, tuple), None, Mapping(dictionary), mutable and immutable data types.	**2 Hour**
	• **Operators** ➢ Arithmetic operators, relational operators, logical operators, assignment operators, augmented assignment operators, identity operators (is, is not), membership operators (in not in).	**3 Hours**
	• **Expressions, statement, type conversion, and input/output** ➢ Precedence of operators, expression, evaluation of an expression, type-conversion (explicit and implicit conversion), accepting data as input from the console and displaying output.	**3 Hours**
	• **Errors: S**yntax errors, logical errors, and run-time errors.	**2 Hours**
	• **Flow of Control** ➢ Introduction, use of indentation, sequential flow, conditional and iterative flow.	**4 Hours**
	• **Conditional statements** ➢ if, if-else, if-elseif-else.	**5 Hours**
	• **Iterative Statement** ➢ for loop, range (), while loop, break and continue statements, nested loops.	**7 Hours**
	• **Strings** ➢ Introduction, string operations (concatenation, repetition, membership and slicing), traversing a string using loops, built-in functions/methods–len(), capitalize(), title(), lower(), upper(), count(), find(), index(), endswith(), startswith(), isalnum(), isalpha(), isdigit(), islower(), isupper(), isspace(),lstrip(), rstrip(), strip(), replace(), join(), partition(), split().	**10 Hours**

	• **Lists** ➢ Introduction, indexing, list operations (concatenation, repetition, membership and slicing), traversing a list using loops, built-in functions/methods–len(), list(), append(), extend(), insert(), count(), index(), remove(), pop(), reverse(), sort(), sorted(), min(), max(), sum(); nested lists.	**14 Hours**
	• **Introduction to Python modules** ➢ Importing module using 'import <module>' and using from statement, importing math module (pi(), sqrt(), ceil(), floor(), pow(), fabs(), sin(), cos(), tan()); random module (random(), randint(), randrange()), statistics module (mean(), median(), mode()).	**12 Hours**
	• **Functions** ➢ Types of function (built-in functions, functions defined in module, user defined functions), creating user defined function, arguments and parameters, default parameters, positional parameters, function returning value(s), flow of execution, scope of a variable (global scope, local scope).	**14 Hours**
Unit – 2	**E-Commerce** **10 Marks**	**Total 20 Hours**
	• **An introduction to Electronic Commerce** ➢ What is E-Commerce (Introduction and Definition), Main activities E-Commerce, Goals of E-Commerce, Technical Components of E-Commerce, Functions of E-Commerce, Advantages and disadvantages of E-Commerce, Scope of E-Commerce, Electronic Commerce Applications, Electronic Commerce and Electronic Business (C2C, C2G, G2G, B2G, B2P, B2A, P2P, B2A, C2A, B2B, B2C). ➢ Internet, Intranet & Extranet, Role of Internet in B2B Application, Web promotion, Banner, Exchange, Shopping Bots.	**8 Hours**
	• **Electronic Payment System** ➢ Introduction, Types of Electronic Payment System, Payment Types, Value Exchange System, Credit Card System, Electronic Fund Transfer, Paperless bill, Modern Payment Cash, Electronic Cash.	**6 Hours**
	• **Internet Marketing** ➢ The PROS and CONS of online shopping, The cons of online shopping, Justify an Internet business, Internet marketing techniques, The E-cycle of Internet marketing, Personalization e-commerce.	**6 Hours**

SEMESTER – IV

Course Code: COMA (Theory)

Full Marks: 35 **Contact Hours: 80**

Unit – 1	**Basics of Operating System** **10 Marks**	**Total 20 Hours**
	• **Introduction** ➢ Definition ➢ Basic Operating System functions, Types of Operating System - Batch processing, Multi-programming, Time sharing, Multi-processing, Distributed and Real-time system.	**2 Hours**
	• **Operating System Organization** ➢ Processor and User modes, Kernels, System calls and System programs.	**2 Hours**
	• **Process Management** ➢ System view of process and resources, Process Control Block, I/O and CPU bound process. ➢ Scheduling: Non-Pre-emptive and Pre-emptive scheduling. Basic concept of First-Come-First-Serve (FCFS), Shortest-Job-First (SJF) and Shortest-Remaining-Time-First scheduling. ➢ Deadlock: Basic concepts.	**8 Hours**
	• **Memory Management** ➢ Physical and Logical address space, Memory allocation strategies, Fixed and Variable partitions, Basic concept of Paging and Segmentation, Virtual memory.	**8 Hours**
Unit – 2	**Database Management System** **15 Marks**	**Total 35 Hours**
	• **Introduction** ➢ Drawbacks of Legacy System, Advantages of DBMS, Layered Architecture of Database, Data Independence, Data Models, Schemas and Instances, Database Languages, Database Users, DBA, Data Dictionary.	**3 Hours**
	• **Entity Relationship (ER) Modeling** ➢ Entity, Attributes and Relationship, Structural Constraints, Keys (Super Key, Key, Candidate Key, Alternate Key, Primary Key, Foreign Key), ERDiagram of Some Example Database, Weak and strong Entity Set.	**7 Hours**
	• **Relational Model** ➢ Basic Concepts of Relational Model, Relational Algebra.	**8 Hours**
	• **Integrity Constraints** ➢ Domain Constraints, Referential Integrity, View.	**2 Hours**

	• **SQL** ➢ Introduction, Data Definition Language and Data Manipulation Language, Data type (char(n), varchar(n), int, float, date), constraints (not null, unique, primary key), create database, use database, show databases, drop database, show tables, create table, describe table, alter table (add and remove an attribute, add and remove primary key), drop table, insert, delete, select, operators (mathematical, relational and logical), aliasing, distinct clause, where clause, in, between, order by, meaning of null, is null, is not null, like, update command, delete command, aggregate functions (max, min, avg, sum, count), group by, having clause.	**15 Hours**
Unit – 3	**Foundation of Artificial Intelligence (AI)** **10 Marks**	**Total 25 Hours**
	• **Introduction to Artificial Intelligence** ➢ Definition and scope of AI. ➢ Historical overview and key milestones. ➢ Differentiating AI from human intelligence.	**4 Hours**
	• **AI Subfields and Technologies** ➢ Machine learning: Supervised, unsupervised, and reinforcement learning. ➢ Deep learning and neural networks. ➢ Natural language processing (NLP) and computer vision.	**10 Hours**
	• **Applications of AI** ➢ AI in finance: Fraud detection, algorithmic trading, and risk assessment. ➢ AI in customer service and chatbots. ➢ AI in education: Personalized learning and intelligent tutoring systems.	**8 Hours**
	• **Ethical and Social Implications of AI** ➢ Bias and fairness in AI systems. ➢ Impact of AI on employment and the workforce. ➢ AI and social inequality.	**3 Hours**