



COMPUTER SCIENCE
Course Code: 176
CLASS XI — CURRICULUM DOCUMENT
Academic Year 2026-27

Theory Paper

Maximum Marks: 70
Time: 3 Hours

1. Rationale

The Computer Science course is designed to cultivate computational thinking and problem-solving skills essential for learners in a technology-driven world. It provides hands-on programming experience across multiple paradigms — procedural, object-oriented, scripting, and web-based — enabling students to appreciate the breadth and applicability of computing.

The course emphasizes digital literacy and ethical computing practices while fostering awareness of India's rich contributions to mathematics, logic, and computation. It builds both technical competence and a sense of cultural and intellectual continuity.

The course also introduces students to the rapidly evolving field of Artificial Intelligence. Learners explore core AI concepts — from supervised and unsupervised learning to the use of Python libraries such as NumPy, Pandas, and scikit-learn — giving them a practical entry point into data-driven problem solving. Connections are drawn to classical Indian systems of logical reasoning, such as Nyaya and Tarka Shastra, situating modern AI within a broader intellectual tradition. Students are also sensitised to the societal implications of AI, including issues of bias, privacy, and responsible deployment, preparing them to engage with technology not merely as users but as informed and ethical practitioners.

This curriculum serves as a bridge between foundational ICT learning at the school level and advanced studies in Computer Science, Information Technology, and Data Science at the higher education level.

2. Course Competencies

On successful completion of this course, students will be able to:

- Identify major computer components and explain their role in computation.
- Apply number systems, Boolean logic, and reasoning in problem-solving contexts.
- Write structured programs in Python and SQL using both procedural and OOP approaches.
- Create basic Machine Learning demonstrations using Python libraries.
- Design small projects using web technologies (HTML, CSS, JavaScript).
- Appreciate Indian Knowledge System (IKS) contributions to computing and relate them to modern computer science.

Naalhu Nidhe
24/07/26

3. Pedagogy

- Experiential Learning — 60% of instruction time devoted to practical work.
- Interdisciplinary Projects — web applications in retail, healthcare, and IKS-based algorithm design.
- Critical Thinking Tasks — logic puzzles, case studies, and reasoning exercises.
- Skill Integration — coding, presentation, and collaborative teamwork.

4. Distribution of Marks

Unit No.	Title	Marks
I	Foundations of Computer Science	10
II	Programming Foundations with Python	20
III	Introduction to Database Management System	15
IV	Web Development Basics (HTML, CSS, JS)	15
V	Foundations of Artificial Intelligence	10
Theory Total		70
VI	Practical	30
Grand Total		100

5. Unit-wise Syllabus

Unit I: Foundations of Computer Science

Chapter 1: Foundations of Computer Science

- Origin of Computers: Abacus, Napier's Bones, Slide Rule, Pascal's Calculator, Difference Engine, The Analytical Engine, Mechanical and Electrical Calculator, Contemporary Electronic Calculator
- Generation of Computers: First to Fifth Generation Computers (Present and Beyond)
- Early Indian contributions to mathematics and computing: Pingala's Binary Concepts in Chanda-sastra, Contributions of Aryabhata and Brahmagupta, Brahmagupta's Algebraic Advancements
- Logical Reasoning and Computational Thinking: Links to Modern Computer Science, Sulba Sutras' Recursive Geometry, Recursive Enumerations in Pingala

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- Logical Reasoning in Indian Philosophical Systems: Computational Thinking Reflected in Ancient Texts
- Interrelation with Modern Computer Science and Programming

Chapter 2: Computer System

- Components of Computer System: Computer Hardware
- How Computers Work? Input, Storage, The primary memory, The secondary memory
- Processing
- Operational Unit: Arithmetic Logical Unit (ALU), Control Unit (CU)
- The Central Processing Unit
- Output
- System Unit: Ports and Connectors, Power Supply, Motherboard
- Computer Software: Examples and types of software, what is an Operating System
- Characteristics / Features of a Computer
- Advantages of Computers, Application Areas of Computers
- Computer Ethics, Safety and Security
- Future Trends in Computing

Chapter 3: Number System

- Significance of Number System in programming
- Computer Organization Representation of Number System: Fixed-point representation, Floating-point representation, Signed and unsigned representation, Binary-coded decimal (BCD)
- Pros and cons of Number System
- Types of Number Systems in Computer Organization: Binary Number System, Octal Number System, Decimal Number System, Hexadecimal Number System
- Some More Important Number Systems in Computer Organization: ASCII (American Standard Code for Information Interchange), Unicode, ISCII (Indian Script Code for Information Interchange)
- Conversion Between Number Systems: Decimal to Binary Conversion, Decimal to Hexadecimal Conversion, Decimal to Octal Conversion
- Logic & Reasoning: What is Reasoning? Propositions and Their Analyticity, Connectives (Logical Operators), What is Logic?
- Logic gates: Why Study Logic Before Boolean Algebra and Logic Gates?
- Illustrative Example Connecting Reasoning to Logic Gates
- How Logic Gates Work Physically Inside a Computer
- Introduction to an Algorithm: Representation of Algorithm, what is a Source Code, Errors in Compilation, Executable Code

Unit II: Programming Foundations with Python

Chapter 4: Introduction to Python

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- Introduction: History, Features, Limitations, Applications
- Getting Started with Python: Python Installation, writing First Python Programme
- Python Tokens: Keywords, Identifiers/Variables, Literals, Operators, Comments
- Python Data Types: Number/Numeric Data Type, Boolean Data Type, Sequence Data Type, Mapping
- Type Conversion: Explicit Conversion, Implicit Conversion, Getting the Data Type
- Expressions
- Input and Output in Python

Chapter 5: Control Structures, Data Types and Data Structures

- Control Statements/Control Structures: Conditional, Selection, or Decision-making Statement, Repetition, Looping, or Iteration Statements, Jump Statements (Control Flow Modifiers)
- Mutable and Immutable Variables: Types
- Data Structures: Lists, Tuples, and Strings, Positive and Negative indices, Slicing
- Built-in String Functions & Methods, Built-in List Functions & Methods
- Tuples, Sets, Dictionary

Chapter 6: Functions, Modules and Object-Oriented Programming in Python

- Functions: Benefits and Types
- Function Arguments: Required Arguments, Keyword Arguments, Default Arguments, Variable-length/Arbitrary Arguments, Scope of Variables
- Returning Values from Functions
- Modules in Python: Benefits, Types
- Object-Oriented Concepts in Python: Class, Object, Constructor, self, Types of Attributes, Methods
- Abstraction
- Inheritance: Types
- Polymorphism: Types, why is it useful? Overloading vs Overriding

Unit III: Introduction to Database Management System

Chapter 7: Introduction to Database Management System

- Database and its need
- Problem with the Old Way: File Processing System, ACID Properties, Applications of DBMS
- The Four Building Blocks of a DBMS: Data, Hardware, Software, Users
- Data Models: Entity-Relationship Model, Record-Based Models
- Data Abstraction
- Schema and Instances: The Three-Level Schema Architecture
- Data Independence
- Database Languages

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- Structure of DBMS: Database Users, The Database Administrators, Query Processor, Storage Manager, Disk Storage
- Client-Server Architecture: Components, Two-Tier Architecture, Three-Tier Architecture, Advantages

Chapter 8: Introduction to SQL

- What is SQL
- SQL Data Types
- Classification of SQL Commands
- DDL Commands: CREATE, DESCRIBE, ALTER, RENAME, TRUNCATE, DROP
- DML Commands: INSERT, SELECT, UPDATE, DELETE
- Filtering and Searching Data: Comparison Operators, Logical Operators- AND, OR, NOT, Special Operators- BETWEEN, IN, NOT IN, LIKE
- Making Output More Useful: ORDER BY, Column Alias, Arithmetic Operations in SELECT, Concatenation
- Aggregate Functions: GROUP BY, HAVING
- JOIN: Types
- Views: Creating and Using Views, why use Views?
- Handling NULL Values: Effect of NULL in Arithmetic Operations and Aggregate Functions

Chapter 9: Database Design and Normalisation

- Introduction
- Keys: Types
- Functional Dependency- How Data Pieces Connect
- Normalisation- The Art of Organising Data: Problems in poorly Designed tables, Benefits
- Normal Forms: First Normal Form, Second Normal Form, Third Normal Form, Boyce-Codd Normal Form
- Database Anomalies: Insertion Anomaly, Update Anomaly, Deletion Anomaly, How Normalisation Solves All Anomalies

Unit IV: Web Development Basics

Chapter 10: Introduction to HTML

- HTML: Introduction, Uses, HTML vs XHTML,
- The Grammar of HTML: Tags, Elements, and Attributes
- Structure of an HTML Document: The Blueprint, Saving and Opening an HTML File, Basic Structure of an HTML Document
- Basic Text Markup, Images in HTML, Hypertext Links, Lists, Tables, Forms,

Chapter 11: Introduction to Cascading Style Sheets (CSS)

- Introduction, Benefits,
- Properties: Text and Font Properties, Box Model, Background

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- Level of Style Sheets
- Style Specification Formats: Selector Forms
- List Properties, Alignment of Text, color, Background Images, The and <div> Tags

Chapter 12: Basics of JavaScript

- Introduction of JavaScript: Key Features
- Object Orientation and JavaScript, General Syntactic Characteristics
- Primitives, Operations, and Expressions
- Screen Output and Keyboard Input
- Control Statements
- Callback Functions
- JavaScript Objects: Object model and Hierarchy
- Fundamental JavaScript Directives

Unit V: Foundations of Artificial Intelligence

Chapter 13: Introduction To AI

- Introduction: Human Intelligence vs Machine Intelligence, Definition, Importance of Artificial Intelligence
- History and Evolution of Artificial Intelligence: Early Rule-Based Systems, Modern Artificial Intelligence, Timeline of AI Development
- Conventional Programming vs Artificial Intelligence
- Major Branches of Artificial Intelligence: Machine Learning, Natural Language Processing (NLP), Computer Vision, Robotics, Expert System, Speech Recognition
- Goals, Scope and Importance of Artificial Intelligence: Main Goals of AI, Long-Term Goals of AI, Importance and Scope of AI
- AI in Daily Life and Future Applications
- Indian Knowledge System and AI Nyaya and Tarka Shastra: Introduction to Indian Logical Thinking, Nyaya Philosophy, Tarka Shastra, Connection with Modern AI
- Ethical Use of Artificial Intelligence

Chapter 14: Data and Machine Learning Fundamentals

- Introduction To Data and Machine Learning: What is Data? Data vs Information, why Data Matters?
- Concept of Data: Types, Model, Digital data in AI Systems,
- Features and Labels
- Datasets and Data Collection: Types, Data Collection Methods, Data Quality, Ethical Issues in Data Collection
- Learning Paradigms: learning in Machines, Supervised Learning, Unsupervised Learning, Reinforcement learning
- Applications of ML
- Training vs Testing: Definition, Training vs Testing, Overfitting and Underfitting

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- Simple algorithms: Linear Regression, Decision Trees, Clustering

Chapter 15: Python Libraries and Applications

- Python Role in artificial Intelligence and Data Science
- Python for Artificial Intelligence
- Introduction to NumPy: Definition, NumPy Arrays, Basic Operations Using NumPy, Role of NumPy in Machine Learning
- Introduction to Pandas: Definition and Importance, DataFrames and series, Data Handling Using pandas, Role of Pandas in AI Systems
- Introduction to scikit-learn: Machine Learning Library in Python, Machine Learning Tasks Supported, Simple machine Learning Workflow, Importance of Scikit-learn for Beginners
- Data Visualisation in Artificial Intelligence: Importance, Matplotlib, seaborn, Visualisation in Machine Learning
- Ethical Awareness in Artificial Intelligence

6. Practical Assessment

S.No.	Component	Description	Marks
1	Lab Test	Python program (60% logic + 20% documentation + 20% code quality)	12
2	Report File	Minimum 20 Python programs (Report file: 7 marks + Viva voce: 3 marks)	10
3	Project	Mini-project (see project options below)	8
		Total	30

Suggested Mini-Projects

- Train a model to classify images or text using Python ML libraries.
- Build a chatbot or recommendation prototype.
- Prepare a case study on 'AI for Social Good' with analysis and presentation.

Note for Teachers: At least 60% of instructional time should be allocated to hands-on lab work.
 IKS Integration: Educators are encouraged to weave Indian Knowledge System references organically across units.
 Assessment Philosophy: Prioritise logical thinking, code quality, and documentation alongside correctness.

