

Textbook for CBSE Class XII

INFORMATICS PRACTICES

With

Python

As per Latest Syllabus

PREETI ARORA

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2025
EDITION

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PREETI ARORA

DOEACC 'A' level, M.Sc–IT, M.Tech–IT
Sr. Computer Science Teacher

Includes

- Assertion and Reasoning Based Questions
 - Case-Based/Source-Based Integrated Questions
 - Project Work
 - Viva Voce
 - Model Test Paper
 - Practice Paper
- ❖ Data Handling using Pandas
 - ❖ Data Visualization using Matplotlib
 - ❖ Review of Database Concepts and SQL
 - ❖ Database Query using SQL
 - ❖ Computer Networks
 - ❖ Societal Impacts

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PREFACE

Programming is important for learning to innovate and create eco-friendly solutions to global problems. Programming is also important in our day-to-day life to enhance the power of computers and internet. This book's core foundation lies in the Python language, offering a vital pathway to acquire innovative programming solutions and take a significant leap forward in our learning journey.

Informatics Practices with Python (065) for Class XII fully meets the latest syllabus requirements and strictly adheres to guidelines laid down by the CBSE. This thoroughly revised book deals with detailed concepts of Data Handling using Pandas, Data Visualization using Matplotlib, Relational Database Management System (SQL), Computer Networks and Societal Impacts.

Python is a popular Object-Oriented Programming Language used both for stand-alone programs and scripting applications in a variety of domains. This book adopts a contemporary approach to the most popular Python library, Pandas, with emphasis on principles of effective and good programming, such as clarity, readability and efficiency in program design. Thus, an interactive programming style has been emphasized and expressed throughout the book.

The hallmark of this book is that it teaches Python Pandas concepts in detail as well as usage of several other Python libraries, such as plotting graphs and charts using Matplotlib. With easy-to-understand examples, practical implementations and other tools, students will learn how to create and implement Pandas series and dataframe and perform data manipulation and analysis using advanced associated operations.

In this book, there are ample case studies available to help students understand the basic concepts of Computer Networks with a student-centred approach.

The text of the book is conveyed in a friendly and easy-to-comprehend language. The book includes concise and practical example programs, complemented by diagrams and real-life application illustrations. Each chapter includes thoroughly tested, debugged and error-free codes accompanied by screenshots.

Based on the CBSE curriculum, the book has been divided into four units:

Unit I: Data Handling using Pandas and Data Visualization – Chapters 1 and 2

This unit contains two chapters covering fundamentals of Pandas including series and dataframe. Advanced concepts of Pandas such as importing/exporting data between CSV files and dataframes have been explained in detail with ample examples and associated codes.

Apart from the above, detailed concepts of data visualization using Matplotlib in terms of line chart, bar chart and histograms have also been thoroughly discussed.

Unit II: Review of Database Concepts and Database Query using SQL – Chapters 3 and 4

This unit covers revision of database concepts and SQL commands as well as implementation and usage of SQL functions such as mathematical, string, date and aggregate functions. Besides, it also covers important SQL clauses such as group by, having and order by along with cartesian product, equi and natural join operations in SQL.

Unit III: Introduction to Computer Networks – Chapter 5

This unit covers concepts of computer networking, types of networks, network devices, network topologies, introduction to internet and its applications and detailed concepts of web page, website and web browsers.

Unit IV: Societal Impacts – Chapter 6

This unit deals with digital footprints, netiquette, intellectual property rights (IPR), plagiarism, licensing, free and open-source software (FOSS), cybercrime and cyber laws, hacking, phishing and cyberbullying along with the Indian IT Act. This unit also includes topics on e-waste hazards and e-waste management and awareness about health concerns related to the usage of technology.

The book includes five appendices containing **Descriptive Statistics and Aggregate Functions in Pandas, Sample Project on Frequent Forest Fires in India, Viva Voce, Model Test Paper (Solved) and Practice Paper**. Apart from these, **CBSE Sample Question Paper (with Solutions)** can also be accessed by scanning the relevant QR Code.

As part of the Web Support, Presentation on Python Pandas, Program Codes and Projects based on Pandas Dataframe-CSV Connectivity and Data Visualization, Practical File and Viva Voce questions are available online and can be accessed at sultan-chand.com/ws/ipp12. Besides, subject-related updates, if any, will also be made available online in due course.

I am confident that students and teachers will benefit immensely by making best use of this book. Your feedback is important. Any suggestions for the improvement of the book will be highly appreciated and duly acknowledged.

I extend my heartfelt gratitude to Ms. Rinku Kumari and Ms. Payal Bhattacharjee for their valuable suggestions during the course of my writing this book.

Last but not the least, I extend my sincere appreciation to my esteemed publishers, **Sultan Chand & Sons (P) Ltd**, for their patience, invaluable guidance and unwavering support.

AUTHOR

Syllabus

INFORMATICS PRACTICES

CLASS XII Code No. 065

Distribution of Marks and Periods

Unit No.	Unit Name	Marks	Periods (Theory)	Periods (Practical)	Total Periods
1.	Data Handling using Pandas and Data Visualization	25	25	25	50
2.	Database Query using SQL	25	20	17	37
3.	Introduction to Computer Networks	10	12	-	12
4.	Societal Impacts	10	14	-	14
	Project	-	-	7	7
	Practical	30	-	-	-
	Total	100	71	49	120

Unit 1: DATA HANDLING USING PANDAS

- Introduction to Python libraries – Pandas, Matplotlib
- Data structures in Pandas – Series and DataFrames
- Series: Creation of Series from – ndarray, dictionary, scalar value; mathematical operations; Head and Tail functions; Selection, Indexing and Slicing
- Dataframes: creation – from dictionary of Series, list of dictionaries, Text/CSV files; display; iteration; Operations on rows and columns: add, select, delete, rename; Head and Tail functions; Indexing using Labels, Boolean Indexing; Importing/Exporting data between CSV files and DataFrames

Data Visualization

- Purpose of plotting; drawing and saving following types of plots using Matplotlib – line plot, bar graph, histogram
- Customizing plots – adding label, title, and legend in plots

Unit 2: DATABASE QUERY USING SQL

- Revision of database concepts and SQL commands covered in class XI
- Math functions: POWER(), ROUND(), MOD()
- Text functions: UCASE()/UPPER(), LCASE()/LOWER(), MID()/SUBSTRING()/SUBSTR(), LENGTH(), LEFT(), RIGHT(), INSTR(), LTRIM(), RTRIM(), TRIM()
- Date Functions: NOW(), DATE(), MONTH(), MONTHNAME(), YEAR(), DAY(), DAYNAME()
- Aggregate Functions: MAX(), MIN(), AVG(), SUM(), COUNT(); using COUNT(*)
- Querying and manipulating data using Group by, Having, Order by
- Working with two tables using equi-join

Unit 3: INTRODUCTION TO COMPUTER NETWORKS

- Introduction to networks, Types of networks: PAN, LAN, MAN, WAN
- Network Devices – modem, hub, switch, repeater, router, gateway
- Network Topologies – Star, Bus, Tree, Mesh
- Introduction to Internet, URL, WWW, and its applications – Web, Email, Chat, VoIP
- Website – Introduction, difference between a website and webpage, static vs dynamic web page, web server and hosting of a website
- Web Browsers – Introduction, commonly used browsers, browser settings, add-ons and plug-ins, cookies

Unit 4: SOCIETAL IMPACTS

- Digital footprint, net and communication etiquette, data protection, intellectual property rights (IPR), plagiarism, licensing and copyright, free and open source software (FOSS), cybercrime and cyber laws, hacking, phishing, cyber bullying, overview of Indian IT Act
- E-waste – Hazards and management
- Awareness about health concerns related to the usage of technology

5. PROJECT WORK

The aim of the class project is to create tangible and useful IT application. The learner may identify a real-world problem by exploring the environment, *e.g.*, students can visit shops/business places, communities or other organizations in their localities and enquire about functioning of the organization, and how data is generated, stored and managed.

The learner can take data stored in CSV or database file and analyze using Python libraries and generate appropriate charts to visualize.

Learners can use Python libraries of their choice to develop software for their school or any other social good.

Learners should be sensitized to avoid plagiarism and violation of copyright issues while working on projects. Teachers should take necessary measures for this. Any resources (data, image, etc.) used in the project must be suitably referenced.

The project can be done individually or in groups of 2 to 3 students. The project should be started by students at least 6 months before the submission deadline.

6. DISTRIBUTION OF PRACTICAL MARKS

S. No.	UNIT NAME	Marks
1.	Programs using Pandas and Matplotlib	8
2.	SQL Queries	7
3.	Practical file (minimum of 15 programs based on Pandas, 4 based on Matplotlib and 15 SQL queries must be included)	5
4.	Project Work (using concepts learned in class XI and XII)	5
5.	Viva Voce	5
	TOTAL	30

7. SUGGESTED PRACTICAL LIST

7.1 DATA HANDLING

1. Create a Pandas series from a dictionary of values and a ndarray
2. Given a Series, print all the elements that are above the 75th percentile
3. Create a dataframe quarterly sales where each row contains the item category, item name and expenditure. Group the rows by the category and print the total expenditure per category.
4. Create a dataframe for examination result and display row labels, column labels, data types of each column and the dimensions
5. Filter out rows based on different criteria such as duplicate rows
6. Importing and exporting data between pandas and CSV file

7.2 VISUALIZATION

1. Given the school result data, analyze the performance of the students on different parameters, *e.g.*, subject-wise or class-wise.
2. For the DataFrames created above, analyze and plot appropriate charts with title and legend.
3. Take data of your interest from an open source (*e.g.*, data.gov.in), aggregate and summarize it. Then, plot it using different plotting functions of the Matplotlib library.

7.3 DATA MANAGEMENT

1. Create a student table with the student id, name and marks as attributes where the student id is the primary key.
2. Insert the details of a new student in the above table.
3. Delete the details of a student in the above table.
4. Use the select command to get the details of the students with marks more than 80.
5. Find the min, max, sum and average of the marks in a student marks table.
6. Find the total number of customers from each country in the table (customer ID, customer Name, country) using group by.
7. Write an SQL query to order the (student ID, marks) table in descending order of the marks.

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