

Informatics Practices

CLASS XII

Code No. 065

2021-2022

1. Prerequisite: Informatics Practices – Class XI

2. Learning Outcomes

At the end of this course, students will be able to:

- Create Series, Data frames and apply various operations.
- Perform aggregation operations, calculate descriptive statistics.
- Visualize data using relevant graphs.
- Design SQL queries using aggregate functions.
- Import/Export data between SQL database and Pandas.
- Learn terminology related to networking and the internet.
- Identify internet security issues and configure browser settings.
- Explain the impact of technology on society including gender and disability issues.

3. Distribution of Marks and Periods

Unit No	Unit Name	Marks	Periods Theory	Periods Practical	Total Period
1	Data Handling using Pandas and Data Visualization	30	50	40	90
2	Database Query using SQL	25	30	22	52
3	Introduction to Computer Networks	7	12	2	14
4	Societal Impacts	8	14	-	14
	Project	-	-	10	10
	Practical	30	-	-	-
	Total	100	106	74	180

4. Unit Wise syllabus

Unit 1: Data Handling using Pandas and Data Visualization

Data Handling using Pandas - I

Introduction to Python libraries- Pandas, Matplotlib.

Data structures in Pandas - Series and data frames.

Series: Creation of series from ndarray, dictionary, scalar value; mathematical operations; series attributes, head and tail functions; selection, indexing and slicing.

Data Frames: creation of data frames from dictionary of series, list of dictionaries, text/CSV files, display, iteration. Operations on rows and columns: add (insert/append), select, delete (drop column and row), rename, Head and Tail functions, indexing using labels, Boolean indexing; joining, merging and concatenation of data frames.

Importing/Exporting Data between CSV files and Data Frames. *(for practicals only)*

Data handling using Pandas – II

Descriptive Statistics: max, min, count, sum, mean, median, mode, quartile, Standard deviation, variance.

Data Frame operations: Aggregation, group by, Sorting, Deleting and Renaming Index, Pivoting.

Handling missing values – dropping and filling.

Importing/Exporting Data between MySQL database and Pandas.

Data Visualization : Purpose of plotting, drawing and saving of plots using Matplotlib (line plot, bar graph, histogram, pie chart, frequency polygon, box plot and scatter plot).

Customizing plots: color, style (dashed, dotted), width; adding label, title, and legend in plots.

Unit 2: Database Query using SQL

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.

Operations on Relations - Union, Intersection, Minus, Cartesian Product, JOIN (Cartesian Join, Equi Join, Natural Join)

Unit 3: Introduction to Computer Networks

Introduction to networks, Types of network: 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 etiquettes, 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 applications. 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 the functioning of the organization, and how data are generated, stored and managed. The learner can take data stored in a csv or database file and analyze it using Python libraries and generate appropriate charts to visualize. If an organization is maintaining data offline, then the learner should create a database using MySQL and store the data in tables. Data can be imported in Pandas for analysis and visualization.

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

Sl.No.	Unit Name	Marks
1	Programs using Pandas and Matplotlib	8
2	SQL Queries	5
3	Practical file (minimum of 20 programs based on Pandas , 5 based on Matplotlib and 20 SQL queries must be included)	5
4	Project Work (using concepts learned in class XI and XII)	7
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 an ndarray
2. Given a Series, print all the elements that are above the 75th percentile.
3. Create a Data Frame 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 data frame based on ecommerce data and generate descriptive statistics (mean, median, mode, quartile, and variance)
5. Create a data frame for examination result and display row labels, column labels data types of each column and the dimensions
6. Filter out rows based on different criteria such as duplicate rows..
7. Find the sum of each column, or find the column with the lowest mean.
8. Locate the 3 largest values in a data frame.
9. Subtract the mean of a row from each element of the row in a Data Frame.
10. Replace all negative values in a data frame with a 0.
11. Replace all missing values in a data frame with a 999.
12. Importing and exporting data between pandas and CSV file
13. Importing and exporting data between pandas and MySQL database

7.2 Visualization

14. Given the school result data, analyse the performance of the students on different parameters, e.g subject wise or class wise.
15. For the Data frames created above, analyze and plot appropriate charts with title and legend.
16. 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

17. Create a student table with the student id, name, and marks as attributes where the student id is the primary key.
18. Insert the details of a new student in the above table.
19. Delete the details of a particular student in the above table.
20. Use the select command to get the details of the students with marks more than 80.
21. Create a new table (order ID, customer Name, and order Date) by joining two tables (order ID, customer ID, and order Date) and (customer ID, customer Name, contact Name, country).
22. Create a foreign key in one of the two tables mentioned above
23. Find the min, max, sum, and average of the marks in a student marks table.
24. Find the total number of customers from each country in the table (customer ID, customer Name, country) using group by.
25. Create a new table (name, date of birth) by joining two tables (student id, name) and (student id, date of birth).
26. Write a SQL query to order the (student ID, marks) table in descending order of the marks.

7.4 Introduction to Computer Networks

27. Download, install and configure browser.

Reference:

NCERT Informatics Practices - Text book for class - XII