Informatics Practices

CLASS XI
Code No. 065
2020-2021

1. **Prerequisite :** None

2. **Learning Outcomes :**

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

   ● Identify the components of Computer System.

   ● Create Python programs using different data types, lists and dictionaries.

   ● Explain what is 'data' and analyse using NumPy.

   ● Explain database concepts and Relational Database Management Systems.

   ● Retrieve and manipulate data in RDBMS using Structured Query Language

   ● Identify the Emerging trends in the fields of Information Technology.

3. **Distribution of Marks and Periods :**

Unit No	Unit Name	Marks	Periods Theory	Periods Practical	Total Period
1	Introduction to Computer System	5	10	-	10
2	Introduction to Python	25	35	35	70
3	Data Handling using NumPy	15	28	15	43
4	Database concepts and the Structured Query Language	20	25	25	50
5	Introduction to Emerging Trends	5	7	-	7
	Practical	30	-	-	-
	Total	100	105	75	180

4. Unit Wise syllabus

Unit 1: Introduction to Computer System

Introduction to computer and computing: evolution of computing devices, components of a Computer System and their interconnections, Input/Output devices.

Computer Memory: Units of memory, types of memory – primary and secondary, data deletion, its recovery and related security concerns.

Software: purpose and types – system and application software, generic and specific purpose software.

Unit 2: Introduction to Python

Basics of Python programming, Python interpreter - interactive and script mode, the structure of a program, indentation, identifiers, keywords, constants, variables, types of operators, precedence of operators, data types, mutable and immutable data types, statements, expressions, evaluation and comments, input and output statements, data type conversion, debugging.

Control Statements: if-else, for loop

Lists: list operations - creating, initializing, traversing and manipulating lists, list methods and built-in functions.

Dictionary: concept of key-value pair, creating, initializing, traversing, updating and deleting elements, dictionary methods and built-in functions.

Unit 3: Data Handling using NumPy

Data and its purpose, importance of data, structured and unstructured data, data processing cycle, basic statistical methods for understanding data - mean, median, mode, standard deviation and variance.

Introduction to NumPy library, NumPy arrays and their advantage, creation of NumPy arrays; indexing, slicing, and iteration; concatenating and splitting array;

Arithmetic operations on one Dimensional and two Dimensional arrays.

Calculating max, min, count, sum, mean, median, mode, standard deviation, variance on NumPy arrays.

Unit 4: Database concepts and the Structured Query Language

Database Concepts: Introduction to database concepts and its need, Database Management System.

Relational data model: Concept of domain, tuple, relation, candidate key, primary key, alternate key, foreign key.

Advantages of using Structured Query Language, Data Definition Language, Data Query Language and Data Manipulation Language, Introduction to MySQL, Creating a database using MySQL, Data Types

Data Definition: CREATE TABLE, DROP TABLE, ALTER TABLE.

Data Query: SELECT, FROM, WHERE.

Data Manipulation: INSERT, UPDATE, DELETE.

Unit 5: Introduction to the Emerging Trends

Artificial Intelligence, Machine Learning, Natural Language Processing, Immersive experience (AR, VR), Robotics, Big data and its characteristics, Internet of Things (IoT), Sensors, Smart cities, Cloud Computing and Cloud Services (SaaS, IaaS, PaaS); Grid Computing, Block chain technology.

Practical Marks Distribution

S.No.	Unit Name	Marks
1	Problem solving using Python programming language	8
2	Problem solving using NumPy	5
3	Creating database using MySQL and performing Queries	5
4	Practical file (minimum of 20 python programs , 5 Numpy programs and 20 SQL queries)	7
5	Viva-Voce	5
	Total	30

5. Suggested Practical List :

5.1 Programming in Python

1. To find average and grade for given marks.
2. To find sale price of an item with given cost and discount (%).
3. To calculate perimeter/circumference and area of shapes such as triangle, rectangle, square and circle.
4. To calculate Simple and Compound interest.
5. To calculate profit-loss for given Cost and Sell Price.
6.   To calculate EMI for Amount, Period and Interest.
7.   To calculate tax - GST / Income Tax.
8. To find the largest and smallest numbers in a list.
9. To find the third largest/smallest number in a list.
10. To find the sum of squares of the first 100 natural numbers.
11. To print the first 'n' multiples of given number.
12. To count the number of vowels in user entered string.
13. To print the words starting with a particular alphabet in a user entered string.
14. To print number of occurrence of a given alphabet in a given string.
15. Create a dictionary to store names of states and their capitals.
16. Create a dictionary of students to store names and marks obtained in 5 subjects.
17. To print the highest and lowest values in the dictionary.

5.2 Numpy Program

18. To create an array of 1D containing numeric values 0 to 9.

19. To create a NumPy array with all values as 0.

20. To extract values at odd numbered position from a NumPy array.

21. To create a 1-D array having 12 elements usinf arange(). Now, convert this array into a 2-D array with size 4X3.

22. To perform basic arithmetic operations on 1D and 2D array .

5.3 Data Management: SQL Commands

23. To create a database

24. To create student table with the student id, class, section, gender, name, dob, and marks as attributes where the student id is the primary key.

25. To insert the details of at least 10 student in the above table.

26. To delete the details of a particular student in the above table.

27. To increase marks by 5% for those students who have Rno more than 20.

28. To display the entire content of table.

29. To display Rno, Name and Marks of those students who are scoring marks more than 50.

30. To find the average of marks from the student table.

31. To find the number of students, who are from section 'A'.

32. To add a new column email in the above table with appropriate data type.

33. To add the email ids of each student in the previously created email column.

34. To display the information all the students, whose name starts with 'AN' (Examples: ANAND, ANGAD,..)

35. To display Rno, Name, DOB of those students who are born between '2005- 01-01' and '2005-12-31'.

36. To display Rno, Name, DOB, Marks, Email of those male students in ascending order of their names.

37. To display Rno, Gender, Name, DOB, Marks, Email in descending order of their marks.

38. To display the unique section available in the table.

Reference:

NCERT Informatics Practices - Text book for class - XI

Informatics Practices

CLASS XII

Code No. 065

2020-2021

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 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; Head and Tail functions; Selection, Indexing and Slicing.

Data Frames: 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; Joining, Merging and Concatenation.

Importing/Exporting Data between CSV files and Data Frames.

Data handling using Pandas – II

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

DataFrame 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 following types 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

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.

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 are 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. 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.

Practical Marks Distribution

S.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

5. Suggested Practical List

5.1 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

5.2 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.

5.3 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.

5.4 Introduction to Computer Networks

27. Download, install and configure browser.

Reference:

NCERT Informatics Practices - Text book for class - XII