Bachelor in Vocation - Software Development

Category-I

DISCIPLINE SPECIFIC CORE COURSE – 1: Programming using Python

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Programming using Python	**4**	**2**	**0**	**2**	**Class XII pass with Mathematics**	**NIL**

Learning Objectives

1. *To introduce the programming concepts using Python.*
2. *The course focuses on the development of Python programming to solve problems of different domains.*
3. *To introduce the concept of object- oriented programming.*

Learning outcomes

1. *Understand the basics of programming language*
2. *Develop, document, and debug modular Python programs.*
3. *Apply suitable programming constructs and built-in data structures to solve a problem.*
4. *Use and apply various data objects in Python.*
5. *Use classes and objects in application programs and handle files.*

Unit I **(6 hours)**

Introduction to Programming: Problem solving strategies; Structure of a Python program; Syntax and semantics; executing simple programs in Python.

Unit II **(6 hours)**

Creating Python Programs: Identifiers and keywords; Literals, numbers, and strings; Operators; Expressions; Input/output statements; Defining functions; Control structures (conditional statements, loop control statements, break, continue and pass, exit function), default arguments.

Unit III **(6 hours)**

Built-in data structures: Mutable and immutable objects; Strings, built-in functions for string, string traversal, string operators and operations; Lists creation, traversal, slicing and splitting operations,

passing list to a function; Tuples, sets, dictionaries and their operations.

Unit IV **(6 hours)**
Object Oriented Programming: Introduction to classes, objects and methods; Standard libraries.

Unit V **(6 hours)**
File and exception handling: File handling through libraries; Errors and exception handling.
Essential/Recommended readings

1. *Liang, Y. D. (2013). Introduction to Programming using Python. Pearson Education.*
2. *Kamthane, A. N., & Kamthane, A.A. (2017) Programming and Problem Solving with Python, McGraw Hill Education*

Practical Component (60 hours)

1. WAP to find the roots of a quadratic equation.
2. WAP to accept a number 'n' to compute the following:
   a. Check if 'n' is prime
   b. Generate all prime numbers till 'n'
   c. Generate first 'n' prime numbers
   d. Calculate sum of first 'n' natural numbers
3. WAP to create a pyramid of the character '*' and a reverse pyramid

```
        *
       ***
      *****
     *******
    *********
     *******
      *****
       ***
        *
```

4. WAP that accepts a character and performs the following:
   a. print whether the character is a letter or numeric digit or a special character
   b. if the character is a letter, print whether the letter is uppercase or lowercase
   c. if the character is a numeric digit, prints its name in text (e.g., if input is 9, output is NINE)
5. WAP to perform the following operations on a string
   a. Find the frequency of a character in a string.
   b. Replace a character by another character in a string.
   c. Remove the first occurrence of a character from a string.
   d. Remove all occurrences of a character from a string.
6. WAP to swap the first n characters of two strings.
7. Write a function that accepts two strings and returns the indices of all the occurrences of the second string in the first string as a list. If the second string is not present in the first string then it should return -1.
8. WAP to create a list of the cubes of only the even integers appearing in the input list (may have elements of other types also) using for loop and list comprehension.

9. WAP to read a file and
   a. Print the total number of characters, words and lines in the file.
   b. Calculate the frequency of each character in the file. Use a variable of dictionary type to maintain the count.
   c. Print the words in reverse order.
   d. Copy even lines of the file to a file named 'File1' and odd lines to another file named 'File2'.
10. WAP to define a class Point with coordinates x and y as attributes. Create relevant methods and print the objects. Also define a method distance to calculate the distance between any two point objects.
11. Write a function that prints a dictionary where the keys are numbers between 1 and 5 and the values are cubes of the keys.
12. Consider a tuple t1=(1, 2, 5, 7, 9, 2, 4, 6, 8, 10). WAP to perform following operations:
   a. Print half the values of the tuple in one line and the other half in the next line.
   b. Print another tuple whose values are even numbers in the given tuple.
   c. Concatenate a tuple t2=(11,13,15) with t1.
   d. Return maximum and minimum value from this tuple

13. WAP to accept a name from a user. Raise and handle appropriate exception(s) if the text entered by the user contains digits and/or special characters.

DISCIPLINE SPECIFIC CORE COURSE – 2: Computer Fundamentals

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Computer Fundamentals	**4**	**2**	**0**	**2**	**Class XII pass with Mathematics**	**NIL**

Learning Objectives:

1. To introduce the fundamentals of computing devices.
2. To understand the use of computer hardware and software, the Internet, networking and mobile computing.
3. To focus on computer literacy that prepares students for life-long learning of computer concepts and skills.

Learning Outcomes:

1. Bridge the fundamental concepts of computers with the present level of knowledge of the students.

2. Familiarize operating systems, programming languages, peripheral devices, networking, multimedia and internet.
3. Understand binary number system.
4. Understand use of computers in education and research.

UNIT-I **(6 hours)**

Computer Fundamentals: Generations of Computers, Definition, Block Diagram along with its components, characteristics & classification of computers, Limitations of Computers, Applications of computers in various Fields.

UNIT- II **(6 hours)**

Data Representation: Number systems and character representation, binary arithmetic, definition of software, types of software, operating systems as user interface, utility programs.

UNIT-III **(6 hours)**

Devices: Input-Output Devices (with connections and practical demo), memory, primary, secondary, auxiliary memory, RAM, ROM, cache memory, hard disk, optical disk.

UNIT-IV **(6 hours)**

Computer Organization and Architecture: CPU, registers, system bus, main memory unit(MMU),cache memory, inside a computer, SMPS, motherboard, ports and interfaces, expansion code, ribbon cables, memory chips, processors, overview of emerging technology

UNIT-V **(6 hours)**

Use of Computers in Education and Research: Data analysis, heterogeneous storage, e-Library, Google scholar, Domain specific packages such as SPSS, Mathematica etc.

Essential/Recommended readings:

1. Balagurusamy E, Computing Fundamentals and C Programming, Tata McGraw Hill.
2. Norton, Peter, Introduction to Computer, McGraw-Hill
3. Leon, Alexis & Leon, Mathews, Introduction to Computers, Leon Tech World

Practical Component (60 hours)

The practical assignment must include connecting parts of a computer and assembling it to an extent, media formatting and installation of some software. Practical exercises based on Open Office tools using document preparation and spreadsheethandling packages.

A. Text Editor

1. Prepare **a grocery list** having four columns (Serial number, the name of the product,quantity and price) for the month of April, 06.

- Font specifications for Title (Grocery List): 14-point Arial font in bold and italics.
- The headings of the columns should be in 12-point and bold.
- The rest of the document should be in 10-point Times New Roman.
- Leave a gap of 12-points after the title.

2. Design a **time-table form** for your college.

- The first line should mention the name of the college in 16-point Arial Font andshould be bold.
- The second line should give the course name/teacher's name and the department in14-point Arial.
- Leave a gap of 12-points.
- The rest of the document should use 10-point Times New Roman font.
- The footer should contain your specifications as the designer and date of creation.

3. Create the following **one page documents**.

a. Compose a note inviting friends to a get-together at your house, including a list ofthings to bring with them.

b. Design a certificate in landscape orientation with a border around the document.

c. Design a Garage Sale sign.

d. Make a sign outlining your rules for your bedroom at home, using a numbered list.

4. Create the following documents:

(a) A newsletter with a headline and 2 columns in portrait orientation, including at least one image surrounded by text.

(b) Use a newsletter format to promote upcoming projects or events in your classroom or college.

5. Convert **following text to a table**, using comma as delimiterType the following as shown

Color, Style, Item Blue, A980, Van Red, X023, Car
Green, YL724, Truck Name, Age, Sex
Bob, 23, M
Linda, 46, F
Tom, 29, M

B. Spreadsheet

1. Enter the Following data in Excel Sheet

REGIONAL SALES PROJECTION

State	Qtr1	Qtr2	Qtr3	QTR4	QTR Total	Rate	Amount
Delhi	2020	2400	2100	3000		15	
Punjab	1100	1300	1500	1400		20	
U.P.	3000	3200	2600	2800		17	
Haryana	1800	2000	2200	2700		15	
Rajasthan	2100	2000	1800	2200		20	
TOTAL AVERAGE							

(a) Apply Formatting as follow:

i. Title in TIMES NEW ROMAN

ii. Font Size - 14

iii. Remaining text - ARIAL, Font Size -10

iv. State names and Qtr. Heading Bold, Italic with Gray Fill Color.

v. Numbers in two decimal places.
vi. Qtr. Heading in center Alignment.
vii. Apply Border to whole data.
(b) Calculate State and Qtr. Total
(c) Calculate Average for each quarter
(d) Calculate Amount = Rate * Total.

2. Given the following worksheet

	A	B	C	D
1	Roll No.	Name	Marks	Grade
2	1001	Sachin	99	
3	1002	Sehwag	65	
4	1003	Rahul	41	
5	1004	Sourav	89	
6	1005	Harbhajan	56	

Calculate the grade of these students on the basis of following guidelines:

If Marks	Then Grade
>= 80	A+
>= 60 < 80	A
>= 50 < 60	B
< 50	

3. Given the following worksheet

	A	B	C	D	E	F	G
1	**Salesman**	**Sales in (Rs.)**					
2	No.	Qtr1	Qtr2	Qtr3	Qtr4	Total	Commission
3	S001	5000	8500	12000	9000		
4	S002	7000	4000	7500	11000		
5	S003	4000	9000	6500	8200		
6	S004	5500	6900	4500	10500		
7	S005	7400	8500	9200	8300		
8	S006	5300	7600	9800	6100		

Calculate the commission earned by the salesmen on the basis of following Candidates:

If Total Sales	Commission
< 20000	0% of sales
> 20000 and < 25000	4% of sales
> 25000 and < 30000	5.5% of sales
> 30000 and < 35000	8% of sales
>= 35000	11% of sales

The total sales is sum of sales of all the four quarters.

4. A company XYZ Ltd. pays a monthly salary to its employees which consists of basic salary, allowances & deductions. The details of allowances and deductions are as follows:

Allowances

- HRA Dependent on Basic :
  30% of Basic if Basic <=1000
  25% of Basic if Basic>1000 & Basic<=300020% of Basic if Basic >3000
- DA Fixed for all employees :
  30% of Basic
- Conveyance Allowance :
  Rs. 50/- if Basic is <=1000
  Rs. 75/- if Basic >1000 & Basic<=2000
  Rs. 100 if Basic >2000
- Entertainment Allowance :
  NIL if Basic is <=1000
  Rs. 100/- if Basic > 1000

Deductions

- Provident Fund :
  6% of Basic
- Group Insurance Premium :
  Rs. 40/- if Basic is <=1500
  Rs. 60/- if Basic > 1500 & Basic<=3000
  Rs. 80/- if Basic >3000

Calculate the following:
Gross Salary = Basic + HRA + DA + Conveyance + Entertainment
Total deduction = Provident Fund + Group Insurance Premium
Net Salary = Gross Salary – Total Deduction

5. The following table gives year wise sale figure of five salesmen in Rs.

Salesman	2000	2001	2002	2003
S1	10000	12000	20000	50000
S2	15000	18000	50000	60000
S3	20000	22000	70000	70000
S4	30000	30000	100000	80000
S5	40000	45000	125000	90000

(a) Calculate total sale year wise.
(b) Calculate the net sale made by each salesman
(c) Calculate the maximum sale made by the salesman
(d) Calculate the commission for each salesman under the condition.
(i) If total sales > 4, 00,000 give 5% commission on total sale made by the salesman.
(ii) Otherwise give 2% commission.
(e) Draw a bar graph representing the sale made by each salesman.
(f) Draw a pie graph representing the sale made by salesman in 2000.

DISCIPLINE SPECIFIC CORE COURSE – 3: Mathematics for Computing - I

CREDIT DISTRIBUTION, ELIGIBILITY AND PRE-REQUISITES OF THE COURSE

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
Mathematics for Computing - I	**4**	**3**	**1**	**0**	**Class XII pass with Mathematics**	**NIL**

Learning Objectives:

1. *To introduce the fundamental concepts and topics of linear algebra and vector calculus.*
2. *To build the foundation for some of the core courses in later semesters.*

Learning Outcomes:

1. *Perform operations on matrices and sparse matrices.*
2. *Compute the determinant, rank and eigenvalues of a matrix.*
3. *Perform operations on vectors, the dot product and cross product.*
4. *Represent vectors geometrically and calculate the gradient, divergence, curl.*
5. *Apply linear algebra and vector calculus to solve problems in sub-disciplines of computer science.*

Unit I **(12 hours)**

Introduction to Matrix Algebra: Echelon form of a Matrix, Rank of a Matrix, Determinant and Inverse of a matrix, Solution of System of Homogeneous & Non-Homogeneous Equations: Gauss elimination and Solution of System of Homogeneous Equations: Gauss Jordan Method.

Unit II **(16 hours)**

Vector Space and Linear Transformation: Vector Space, Sub-spaces, Linear Combinations, Linear Span, Convex Sets, Linear Independence/Dependence, Basis & Dimension, Linear transformation on finite dimensional vector spaces, Inner Product Space, Schwarz Inequality, Orthonormal Basis, Gram-Schmidt Orthogonalization Process.

Unit III **(16 hours)**

EigenValue and EigenVector: Characteristic Polynomial, Cayley Hamilton Theorem, Eigen Value and Eigen Vector of a matrix, Eigenspaces, Diagonalization, Positive Definite Matrices, Applications to Markov Matrices

Unit IV **(16 hours)**

Vector Calculus: Vector Algebra, Laws of Vector Algebra, Dot Product, Cross Product, Vector and Scalar Fields, Ordinary Derivative of Vectors, Space Curves, Partial Derivatives, Del Operator, Gradient of a Scalar Field, Directional Derivative, Gradient of Matrices, Divergence of a Vector Field, Laplacian

Operator, Curl of a Vector Field.

Essential/Recommended readings:

1. Gilbert Strang, Introduction to Linear Algebra, 5th Edition, Wellesley-Cambridge Press, 2021.
2. Erwin Kreyszig, Advanced Engineering Mathematics, 10th Edition, Wiley, 2015.
3. Gilbert Strang, Linear Algebra and Learning from Data, 1st Edition, Wellesley-Cambridge Press, 2019.
4. R. K. Jain, S. R. K. Iyengar, Advanced Engineering Mathematics, 5th Edition, Narosa, 2016.