

**PYTHON PROGRAMMING****Course Code : 314004**

|                         |                                                                                                                                                                                                                                                     |
|-------------------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|
| <b>Programme Name/s</b> | <b>: Cloud Computing and Big Data/ Computer Technology/ Computer Engineering/ Computer Science &amp; Engineering/ Computer Hardware &amp; Maintenance/ Information Technology/ Computer Science &amp; Information Technology/ Computer Science/</b> |
| <b>Programme Code</b>   | <b>: BD/ CM/ CO/ CW/ HA/ IF/ IH/ SE</b>                                                                                                                                                                                                             |
| <b>Semester</b>         | <b>: Fourth</b>                                                                                                                                                                                                                                     |
| <b>Course Title</b>     | <b>: PYTHON PROGRAMMING</b>                                                                                                                                                                                                                         |
| <b>Course Code</b>      | <b>: 314004</b>                                                                                                                                                                                                                                     |

**I. RATIONALE**

Python is an open source, general-purpose and most versatile programming language. Python code is simple, readable, short, intuitive, and powerful, and thus it is effective for introducing computing and problem solving for beginners. This course covers basic fundamentals of Python programming, which also provides a foundation for further exploration of its more advanced applications in a variety of domains, including application development, data science, artificial intelligence, machine learning, and more.

**II. INDUSTRY / EMPLOYER EXPECTED OUTCOME**

Develop applications using python to solve given problem.

**III. COURSE LEVEL LEARNING OUTCOMES (COS)**

Students will be able to achieve & demonstrate the following COs on completion of course based learning

- CO1 - Develop python programs using control flow statements.
- CO2 - Perform operations on various data structures in Python.
- CO3 - Develop packages to solve given problem using python.
- CO4 - Apply object-oriented approach to solve given problem using python.
- CO5 - Use relevant built-in python package to develop application.

**IV. TEACHING-LEARNING & ASSESSMENT SCHEME**

| Course Code | Course Title       | Abbr | Course Category/s | Learning Scheme          |    |    |    |   |    | Credits | Assessment Scheme |                |           |       |       |     |                  |     |       |     |             |     |     |     |             |
|-------------|--------------------|------|-------------------|--------------------------|----|----|----|---|----|---------|-------------------|----------------|-----------|-------|-------|-----|------------------|-----|-------|-----|-------------|-----|-----|-----|-------------|
|             |                    |      |                   | Actual Contact Hrs./Week |    |    | SL | H | NL |         | Credits           | Paper Duration | Theory    |       |       |     | Based on LL & TL |     |       |     | Based on SL |     |     |     | Total Marks |
|             |                    |      |                   | CL                       | TL | LL |    |   |    |         |                   |                | Practical |       |       |     |                  |     |       |     |             |     |     |     |             |
|             |                    |      |                   |                          |    |    |    |   |    |         |                   |                | FA-TH     | SA-TH | Total |     | FA-PR            |     | SA-PR |     | SLA         |     |     |     |             |
|             |                    |      |                   |                          |    |    |    |   |    |         |                   |                |           |       | Max   | Max | Max              | Min | Max   | Min | Max         | Min | Max | Min |             |
| 314004      | PYTHON PROGRAMMING | PWP  | AEC               | 2                        | -  | 4  | -  | 6 | 3  | -       | -                 | -              | -         | -     | 50    | 20  | 50#              | 20  | -     | -   | 100         |     |     |     |             |

**PYTHON PROGRAMMING****Course Code : 314004****Total IKS Hrs for Sem. : 0 Hrs**

Abbreviations: CL- ClassRoom Learning , TL- Tutorial Learning, LL-Laboratory Learning, SLH-Self Learning Hours, NLH-Notional Learning Hours, FA - Formative Assessment, SA -Summative assessment, IKS - Indian Knowledge System, SLA - Self Learning Assessment

Legends: @ Internal Assessment, # External Assessment, \*# On Line Examination , @\$ Internal Online Examination

Note :

1. FA-TH represents average of two class tests of 30 marks each conducted during the semester.
2. If candidate is not securing minimum passing marks in FA-PR of any course then the candidate shall be declared as "Detained" in that semester.
3. If candidate is not securing minimum passing marks in SLA of any course then the candidate shall be declared as fail and will have to repeat and resubmit SLA work.
4. Notional Learning hours for the semester are (CL+LL+TL+SL)hrs.\* 15 Weeks
5. 1 credit is equivalent to 30 Notional hrs.
6. \* Self learning hours shall not be reflected in the Time Table.
7. \* Self learning includes micro project / assignment / other activities.

**V. THEORY LEARNING OUTCOMES AND ALIGNED COURSE CONTENT**

| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's.                                                                                                                                                                                                                             | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                        | Suggested Learning Pedagogies.                |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------|
| 1     | TLO 1.1 Explain given feature of python.<br>TLO 1.2 Write python program to perform basic input output operations.<br>TLO 1.3 Write python program to solve given expression.<br>TLO 1.4 Implement given decision making statements and looping statements in python program. | <b>Unit - I Introduction to Python and Control flow statements</b><br>1.1 Introduction: Features, History and Applications of Python, Python IDE's<br>1.2 Python building blocks: Indentation, Identifiers, Variable, Comments, Keywords<br>1.3 Basic input output operations: input(), print()<br>1.4 Operators: Arithmetic, Relational, Assignment, Logical, Bitwise, Membership and Identity operator<br>1.5 Control flow statements: Conditional statements (if, if-else, if-elif-else, nested if), Loops in python (while, for, nested loops), Loop manipulation statements (continue, pass, break, else) | Chalk-Board<br>Demonstration<br>Presentations |

## PYTHON PROGRAMMING

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| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's.                                                                                                                                                                                                                                                                                                                 | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                                   | Suggested Learning Pedagogies.                            |
|-------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------------------------------------------|
| 2     | <p>TLO 2.1 Write python program to manipulate lists.</p> <p>TLO 2.2 Write python program to manipulate tuples.</p> <p>TLO 2.3 Write python program to manipulate sets.</p> <p>TLO 2.4 Write python program to manipulate dictionaries.</p>                                                                                                                        | <p><b>Unit - II Data Structures in Python</b></p> <p>2.1 List:</p> <p>a) Defining lists, accessing values from list, deleting list values, updating lists</p> <p>b) Basic list operations</p> <p>c) Built-in list functions/methods</p> <p>2.2 Tuple:</p> <p>a) Defining Tuple, accessing values from Tuple</p> <p>b) Basic Tuple operations</p> <p>c) Built in Tuple functions/methods</p> <p>2.3 Set:</p> <p>a) Defining Sets, accessing values from set, deleting set values</p> <p>b) Basic set operations</p> <p>c) Built in set functions/methods</p> <p>2.4 Dictionary:</p> <p>a) Defining Dictionary, accessing values from Dictionary, deleting Dictionary values, updating Dictionary</p> <p>b) Basic Dictionary operations</p> <p>c) Built in Dictionary functions/methods</p> | Chalk-Board<br>Demonstration<br>Presentations<br>Hands-on |
| 3     | <p>TLO 3.1 Write relevant user defined functions for the given problem.</p> <p>TLO 3.2 Write relevant user defined module for the given problem.</p> <p>TLO 3.3 Write packages for the given problem.</p>                                                                                                                                                         | <p><b>Unit - III Functions, Modules and Packages in Python</b></p> <p>3.1 Functions: Defining function, Calling function, Function arguments, Return statement, Scope of Variable, Lambda functions</p> <p>3.2 Modules: Create user defined Module, Importing a module, Using python built-in modules, Namespace and scoping</p> <p>3.3 Python Packages: Create user defined Package, Importing a Package, Using python built-in Packages, Installing packages using PIP</p>                                                                                                                                                                                                                                                                                                              | Chalk-Board<br>Demonstration<br>Presentations<br>Hands-on |
| 4     | <p>TLO 4.1 Write python program using classes and objects to solve given problem.</p> <p>TLO 4.2 Implement python program using different types of constructors.</p> <p>TLO 4.3 Write program to demonstrate polymorphism.</p> <p>TLO 4.4 Write python code using data abstraction for given problem.</p> <p>TLO 4.5 Apply inheritance for the given problem.</p> | <p><b>Unit - IV Object Oriented Programming in Python</b></p> <p>4.1 Object oriented Concepts: Creating class, Creating object</p> <p>4.2 Constructors in python (Parameterized &amp; Non-Parameterized), the self parameter</p> <p>4.3 Polymorphism: Method Overloading and Overriding</p> <p>4.4 Data Hiding / Abstraction</p> <p>4.5 Inheritance: Single Inheritance, Multiple Inheritance, Multilevel Inheritance</p>                                                                                                                                                                                                                                                                                                                                                                 | Chalk-Board<br>Demonstration<br>Presentations<br>Hands-on |

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| Sr.No | Theory Learning Outcomes (TLO's) aligned to CO's.                                                                                                                                                                                        | Learning content mapped with Theory Learning Outcomes (TLO's) and CO's.                                                                                                                                                                                                                                                                                                                                                                                                                         | Suggested Learning Pedagogies.                                                   |
|-------|------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------|
| 5     | <p>TLO 5.1 Write python program to use pandas package for the given problem.</p> <p>TLO 5.2 Create GUI application using tkinter package for the given problem.</p> <p>TLO 5.3 Create a python application to connect with database.</p> | <p><b>Unit - V Introduction to Built-in Packages in Python</b></p> <p>5.1 Pandas: Use of pandas, pandas series, pandas DataFrames, pandas Read CSV</p> <p>5.2 Creating GUI using tkinter: Introduction to tkinter, Widgets (Entry, Label, Button, RadioButton, Checkbutton), Creating a simple GUI application</p> <p>5.3 Connecting to Database using MySQL: Installing mysql-connector, cursor() object, execute() method, fetchall() method, Creating simple program to connect database</p> | Lecture Using Chalk-Board<br>Flipped Classroom<br>Demonstration<br>Presentations |

**VI. LABORATORY LEARNING OUTCOME AND ALIGNED PRACTICAL / TUTORIAL EXPERIENCES.**

| Practical / Tutorial / Laboratory Learning Outcome (LLO)                                                                                                         | Sr No | Laboratory Experiment / Practical Titles / Tutorial Titles                                                                                                                                                          | Number of hrs. | Relevant COs |
|------------------------------------------------------------------------------------------------------------------------------------------------------------------|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------|--------------|
| LLO 1.1 Install the given Python IDE.                                                                                                                            | 1     | Install given Python IDE.                                                                                                                                                                                           | 2              | CO1          |
| LLO 2.1 Write python program for performing basic input and output operation in given problem.                                                                   | 2     | <p>*1. Write python program to display welcome message on screen.</p> <p>2. Implement the python program to read data from user and display data on screen.</p>                                                     | 2              | CO1          |
| LLO 3.1 Write python program to solve given expression.                                                                                                          | 3     | <p>*Implement a python programs using following operators:</p> <p>1. Arithmetic</p> <p>2. Relational &amp; logical</p> <p>3. Assignment</p> <p>4. Bitwise</p> <p>5. Membership</p> <p>6. Identity</p>               | 2              | CO1          |
| LLO 4.1 Write python program for solving given problem using various if statements.                                                                              | 4     | <p>*Implement a python program to demonstrate the use of following conditional statements:</p> <p>1. if statement</p> <p>2. if..else statement</p> <p>3. if..elif..else statement</p> <p>4. nested if statement</p> | 2              | CO1          |
| <p>LLO 5.1 Write python program for solving given problems using a while loop.</p> <p>LLO 5.2 Write python program for solving given problem using for loop.</p> | 5     | <p>*Implement a python program to demonstrate the use of following looping statements:</p> <p>1. while loop</p> <p>2. for loop</p> <p>3. nested loop</p>                                                            | 2              | CO1          |
| LLO 6.1 Use loop control statements in python for solving given problem.                                                                                         | 6     | Implement python program to demonstrate the use of loop control statements. [continue, pass, break, else]                                                                                                           | 2              | CO1          |
| LLO 7.1 Write python program to perform operations on list.                                                                                                      | 7     | <p>*Implement a python program to perform following operations on the List:</p> <p>1. Create a List</p> <p>2. Access List</p> <p>3. Update List</p> <p>4. Delete List</p>                                           | 2              | CO2          |

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| <b>Practical / Tutorial / Laboratory Learning Outcome (LLO)</b>                                                       | <b>Sr No</b> | <b>Laboratory Experiment / Practical Titles / Tutorial Titles</b>                                                                                                                                                                                   | <b>Number of hrs.</b> | <b>Relevant COs</b> |
|-----------------------------------------------------------------------------------------------------------------------|--------------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------|
| LLO 8.1 Write python program to use built-in functions on list.                                                       | 8            | Implement Python program to demonstrate the use of built-in functions/methods on List (Any Eight Functions/methods)                                                                                                                                 | 2                     | CO2                 |
| LLO 9.1 Write python program to perform operations on tuple.                                                          | 9            | *Implement python program to perform following operations on the Tuple:<br>1. Create a Tuple<br>2. Access Tuple<br>3. Print Tuple<br>4. Delete Tuple<br>5. Convert tuple into list and vice-versa                                                   | 2                     | CO2                 |
| LLO 10.1 Write python program to manipulate the set.                                                                  | 10           | *Implement a python program to perform following operations on the Set:<br>1. Create a Set<br>2. Access Set<br>3. Update Set<br>4. Delete Set                                                                                                       | 2                     | CO2                 |
| LLO 11.1 Use built-in functions/methods on sets in python for solving given problems.                                 | 11           | Implement a python program to perform following functions on Set:<br>1. Union<br>2. Intersection<br>3. Difference<br>4. Symmetric Difference                                                                                                        | 2                     | CO2                 |
| LLO 12.1 Write python program to perform operations on dictionary.                                                    | 12           | *Implement a python program to perform following operations on the Dictionary:<br>1. Create a Dictionary<br>2. Access Dictionary<br>3. Update Dictionary<br>4. Delete Dictionary<br>5. Looping through Dictionary<br>6. Create Dictionary from list | 2                     | CO2                 |
| LLO 13.1 Write function to solve given problem.                                                                       | 13           | Write a user define function to implement following features:<br>1. Function without argument<br>2. Function with argument<br>3. Function returning value                                                                                           | 2                     | CO3                 |
| LLO 14.1 Write python program to create function by selecting appropriate type of argument.                           | 14           | *Implement user defined function for given problem:<br>1. Function positional/required argument<br>2. Function with keyword argument<br>3. Function with default argument<br>4. Function with variable length argument                              | 2                     | CO3                 |
| LLO 15.1 Write python program using anonymous function.<br>LLO 15.2 Write python program to use function in argument. | 15           | Write Python program to demonstrate use of following advanced functions:<br>1. lambda<br>2. map<br>3. reduce                                                                                                                                        | 2                     | CO3                 |
| LLO 16.1 Write user defined module to solve given problem.                                                            | 16           | Write a python program to create and use a user defined module for a given problem.                                                                                                                                                                 | 2                     | CO3                 |
| LLO 17.1 Select appropriate module to solve given problem.<br>LLO 17.2 Use given module to solve problem.             | 17           | Write a python program to demonstrate the use of following module:<br>1. math module<br>2. random module<br>3. os module                                                                                                                            | 2                     | CO3                 |

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| <b>Practical / Tutorial / Laboratory Learning Outcome (LLO)</b>                                                                                                    | <b>Sr No</b> | <b>Laboratory Experiment / Practical Titles / Tutorial Titles</b>                                                                                                                                                          | <b>Number of hrs.</b> | <b>Relevant COs</b> |
|--------------------------------------------------------------------------------------------------------------------------------------------------------------------|--------------|----------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|---------------------|
| LLO 18.1 Write user defined package to solve given problem.                                                                                                        | 18           | *Write python program to create and use a user defined package for a given problem.                                                                                                                                        | 2                     | CO3                 |
| LLO 19.1 Use numpy and matplotlib package to solve given problem.<br>LLO 19.2 Select appropriate methods from numpy and matplotlib package to solve given problem. | 19           | Write a python program to use of numpy package to perform operation on 2D matrix.<br>Write a python program to use of matplotlib package to represent data in graphical form.                                              | 2                     | CO4                 |
| LLO 20.1 Write python program using classes and objects to solve a given problem.                                                                                  | 20           | *Develop a python program to perform following operations:<br>1. Creating a Class with method<br>2. Creating Objects of class<br>3. Accessing method using object                                                          | 2                     | CO4                 |
| LLO 21.1 Write a python program to initialize objects of class using various types of constructors.                                                                | 21           | *Write a python program to demonstrate the use of constructors:<br>1. Default<br>2. Parameterized<br>3. Constructor Overloading                                                                                            | 2                     | CO4                 |
| LLO 22.1 Write a python program to implement polymorphism.                                                                                                         | 22           | *Implement a python program to demonstrate<br>1. Method Overloading<br>2. Method Overriding                                                                                                                                | 2                     | CO4                 |
| LLO 23.1 Write a python program to use data hiding concept in python.                                                                                              | 23           | Write python program to demonstrate data hiding.                                                                                                                                                                           | 2                     | CO4                 |
| LLO 24.1 Select appropriate type of inheritance to solve given problem.<br>LLO 24.2 Write python program using inheritance to solve given problem.                 | 24           | *Write a python program to implement<br>1. Single inheritance<br>2. Multiple Inheritance<br>3. Multilevel inheritance                                                                                                      | 2                     | CO4                 |
| LLO 25.1 Use panda package and its appropriate functions/methods to solve a given problem.                                                                         | 25           | *Implement Python program to perform following operations using panda package:<br>1. Create Series from Array<br>2. Create Series from List<br>3. Access element of series<br>4. Create DataFrame using List or dictionary | 2                     | CO5                 |
| LLO 26.1 Write python program to read CSV file using the panda package.                                                                                            | 26           | Implement python program to load a CSV file into a Pandas DataFrame and perform operations.                                                                                                                                | 2                     | CO5                 |
| LLO 27.1 Use appropriate packages in a python program to create GUI applications.                                                                                  | 27           | *Write python GUI program to import Tkinter package and create a window and set its title.                                                                                                                                 | 2                     | CO5                 |
| LLO 28.1 Write python program to create GUI based python applications using appropriate python packages.                                                           | 28           | Write python GUI program that adds labels and buttons to the Tkinter window.                                                                                                                                               | 2                     | CO5                 |
| LLO 29.1 Write python program to connect database.                                                                                                                 | 29           | Write program to create a connection between database and python.                                                                                                                                                          | 2                     | CO5                 |
| LLO 30.1 Write python program to display the content from database.                                                                                                | 30           | Implement python program to select records from the database table and display the result.                                                                                                                                 | 2                     | CO5                 |

**Note : Out of above suggestive LLOs -**

- '\*' Marked Practicals (LLOs) Are mandatory.
- Minimum 80% of above list of lab experiment are to be performed.
- Judicial mix of LLOs are to be performed to achieve desired outcomes.

**PYTHON PROGRAMMING****Course Code : 314004****VII. SUGGESTED MICRO PROJECT / ASSIGNMENT/ ACTIVITIES FOR SPECIFIC LEARNING / SKILLS DEVELOPMENT (SELF LEARNING)****Activities**

- Students are encouraged to use online tools to improve their learning, such as the e-Kumbh from AICTE and the Virtual Labs from IIT.
- Students should be encouraged to participate in various coding competitions, such as hackathons, online coding contests on websites like hackerrank, Codechef etc.
- At the institution level, encourage students to start a coding club.

**Self Learning**

- Students are encouraged to register themselves in various MOOC's such as Infosys Springboard, Swayam etc. to further enhance their learning.

**Note :**

- Above is just a suggestive list of microprojects and assignments; faculty must prepare their own bank of microprojects, assignments, and activities in a similar way.
- The faculty must allocate judicious mix of tasks, considering the weaknesses and / strengths of the student in acquiring the desired skills.
- If a microproject is assigned, it is expected to be completed as a group activity.
- SLA marks shall be awarded as per the continuous assessment record.
- For courses with no SLA component the list of suggestive microprojects / assignments/ activities are optional, faculty may encourage students to perform these tasks for enhanced learning experiences.
- If the course does not have associated SLA component, above suggestive listings is applicable to Tutorials and maybe considered for FA-PR evaluations.

**VIII. LABORATORY EQUIPMENT / INSTRUMENTS / TOOLS / SOFTWARE REQUIRED**

| Sr.No | Equipment Name with Broad Specifications                                                                                                                            | Relevant LLO Number |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------|---------------------|
| 1     | Any Database Software                                                                                                                                               | 29,30               |
| 2     | Computer System<br>(Any computer system with basic configuration)                                                                                                   | All                 |
| 3     | Python Interpreter / IDE<br>(Any open source python distribution such as anaconda etc)<br>(Any open source IDE such as IDLE, Jupyter Notebook, Spyder, PyCharm etc) | All                 |

**IX. SUGGESTED WEIGHTAGE TO LEARNING EFFORTS & ASSESSMENT PURPOSE (Specification Table)**

| Sr.No              | Unit | Unit Title                                         | Aligned COs | Learning Hours | R-Level  | U-Level  | A-Level  | Total Marks |
|--------------------|------|----------------------------------------------------|-------------|----------------|----------|----------|----------|-------------|
| 1                  | I    | Introduction to Python and Control flow statements | CO1         | 6              | 0        | 0        | 0        | 0           |
| 2                  | II   | Data Structures in Python                          | CO2         | 8              | 0        | 0        | 0        | 0           |
| 3                  | III  | Functions, Modules and Packages in Python          | CO3         | 6              | 0        | 0        | 0        | 0           |
| 4                  | IV   | Object Oriented Programming in Python              | CO4         | 4              | 0        | 0        | 0        | 0           |
| 5                  | V    | Introduction to Built-in Packages in Python        | CO5         | 6              | 0        | 0        | 0        | 0           |
| <b>Grand Total</b> |      |                                                    |             | <b>30</b>      | <b>0</b> | <b>0</b> | <b>0</b> | <b>0</b>    |

**X. ASSESSMENT METHODOLOGIES/TOOLS**

MSBTE Approval Dt. 21/11/2024

Semester - 4, K Scheme

**PYTHON PROGRAMMING****Course Code : 314004****Formative assessment (Assessment for Learning)**

- Continuous assessment based on process and product related performance indicators. Each practical will be assessed considering 1) 60% weightage is to process 2) 40% weightage to product

**Summative Assessment (Assessment of Learning)**

- End Semester Examination, Lab Performance, Viva-voce

**XI. SUGGESTED COS - POS MATRIX FORM**

| Course Outcomes (COs) | Programme Outcomes (POs)                     |                       |                                       |                        |                                                                        |                         |                         | Programme Specific Outcomes* (PSOs) |       |       |
|-----------------------|----------------------------------------------|-----------------------|---------------------------------------|------------------------|------------------------------------------------------------------------|-------------------------|-------------------------|-------------------------------------|-------|-------|
|                       | PO-1 Basic and Discipline Specific Knowledge | PO-2 Problem Analysis | PO-3 Design/ Development of Solutions | PO-4 Engineering Tools | PO-5 Engineering Practices for Society, Sustainability and Environment | PO-6 Project Management | PO-7 Life Long Learning | PSO-1                               | PSO-2 | PSO-3 |
| CO1                   | 2                                            | 1                     | 1                                     | 1                      | -                                                                      | -                       | -                       |                                     |       |       |
| CO2                   | 2                                            | 1                     | 1                                     | 1                      | -                                                                      | -                       | -                       |                                     |       |       |
| CO3                   | 3                                            | 2                     | 2                                     | 2                      | -                                                                      | -                       | -                       |                                     |       |       |
| CO4                   | 3                                            | 3                     | 3                                     | 2                      | -                                                                      | -                       | 1                       |                                     |       |       |
| CO5                   | 3                                            | 2                     | 3                                     | 3                      | -                                                                      | -                       | 1                       |                                     |       |       |

Legends :- High:03, Medium:02,Low:01, No Mapping: -  
 \*PSOs are to be formulated at institute level

**XII. SUGGESTED LEARNING MATERIALS / BOOKS**

| Sr.No | Author                                                    | Title                        | Publisher with ISBN Number                                       |
|-------|-----------------------------------------------------------|------------------------------|------------------------------------------------------------------|
| 1     | R. Nageswara Rao                                          | Core Python Programming      | Dreamtech Press, ISBN-13:9789390457151                           |
| 2     | Mark Lutz                                                 | Learning Python              | O'Reilly Media, Inc, ISBN: 9781449355739                         |
| 3     | David Amos, Dan Bader, Joanna Jablonski, Fletcher Heisler | Python Basics                | Real Python, ISBN-13: 9781775093329                              |
| 4     | Dr. Jeeva Jose                                            | Taming Python by Programming | Khanna Book Publishing CO(P) LTD, New Delhi, ISBN: 9789386173348 |
| 5     | Rupesh Nasre                                              | Python Programming           | AICTE, ISBN 9788195986354 [Online available on AICTE e-Kumbh]    |

**XIII. LEARNING WEBSITES & PORTALS**

| Sr.No | Link / Portal                                                                                                                                                                                                             | Description                                                                                        |
|-------|---------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------------|----------------------------------------------------------------------------------------------------|
| 1     | <a href="https://ekumbh.aicte-india.org/allbook.php">https://ekumbh.aicte-india.org/allbook.php</a>                                                                                                                       | Python Programming                                                                                 |
| 2     | <a href="https://python-iitk.vlabs.ac.in/">https://python-iitk.vlabs.ac.in/</a>                                                                                                                                           | Python Programming Lab                                                                             |
| 3     | <a href="https://spoken-tutorial.org/watch/Python+3.4.3/Input-output/English/">https://spoken-tutorial.org/watch/Python+3.4.3/Input-output/English/</a>                                                                   | Introduction to Python and control flow statements, Data Structures in Python, Function and module |
| 4     | <a href="https://onlinecourses.nptel.ac.in/noc19_cs41/preview">https://onlinecourses.nptel.ac.in/noc19_cs41/preview</a>                                                                                                   | Python Programming Course                                                                          |
| 5     | <a href="https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0130944397935001602592_shared/overview">https://infyspringboard.onwingspan.com/web/en/app/toc/lex_auth_0130944397935001602592_shared/overview</a> | Python for Beginners                                                                               |
| 6     | <a href="https://www.geeksforgeeks.org/python-gui-tkinter/">https://www.geeksforgeeks.org/python-gui-tkinter/</a>                                                                                                         | Python GUI Programming                                                                             |
| 7     | <a href="https://www.w3schools.com/python/python_mysql_getstarted.asp">https://www.w3schools.com/python/python_mysql_getstarted.asp</a>                                                                                   | Python MySQL Database Connectivity                                                                 |

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| Sr.No | Link / Portal                                                                                                                                                   | Description           |
|-------|-----------------------------------------------------------------------------------------------------------------------------------------------------------------|-----------------------|
| 8     | <a href="https://www.tutorialspoint.com/python_pandas/index.htm">https://www.tutorialspoint.com/python_pandas/index.htm</a>                                     | Python pandas package |
| 9     | <a href="https://www.programiz.com/python-programming/object-oriented-programming">https://www.programiz.com/python-programming/object-oriented-programming</a> | OOP using Python      |

**Note :**

- Teachers are requested to check the creative common license status/financial implications of the suggested online educational resources before use by the students

**MSBTE Approval Dt. 21/11/2024****Semester - 4, K Scheme**