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| **Python Programming** |
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| **Course learning objectives (CLOs)** |
| 1. Gain knowledge about basic Python language syntax and semantics to write Python programs and use concepts such as variables, conditional and iterative execution methods etc. |
| 2. Understand the fundamentals of object-oriented programming in Python, including defining classes, objects, invoking methods,exception handling mechanisms. |
| 3. Understand the principles of inheritance, packages and interfaces. |
| 4. Demonstrate the numPy package for scientific computing and data manipulation. |
| 5. To develop full stack web development applications in Python using the Django framework. |

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| Pre-requisites: Basics of Object Oriented Programming using C++/Java |

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| Unit – I | 08 Hours |
| Introduction to Python, use IDLE to develop programs, Basic coding skills,  working with data types and variables, working with numeric data, working with string data, Python functions,  Boolean expressions, selection structure,  iteration structure, Illustrative Programs | |
| Unit – II | 08 Hours |
| Define and use functions and modules, Basic skills for working with lists, work with a list of lists, work with tuples, get started with dictionaries, An introduction to file I/O, use text files, use CSV files, Handle a single exception, handle multiple exceptions Illustrative programs | |
| Unit – III | 08 Hours |
| Object Oriented Programming, An introduction to classes and objects, define a class, work with object composition, work with encapsulation, work with inheritance, override object methods, Using SQLite Manager to work with a database, Using Python to work with a database, Creating a GUI that handles an event Illustrative programs | |
| Unit - IV | 08 Hours |
| NumPy Basics: Arrays and Vectorized Computation: Creating ndarrays, Data Types for ndarrays, Operations between Arrays and Scalars, Basic Indexing and Slicing, Indexing with slices, Boolean Indexing, Transposing Arrays and Swapping Axes. | |
| Unit – V | 08 Hours |
| Getting Started with Pandas: Transposing Arrays and Swapping Axes, Series, DataFrame.  Django Framework: Installing Django, creating an isolated Python environment, installing Django with pip, Mini Project using Django  SciPy | |

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| **Books** | |
|  | Michael Urban and Joel Murach, Python Programming, Shroff/Murach, 2016 |
|  | Wes McKinney, Python for Data Analysis, OReilly, 1st Edition, 2012 |
| **Reference Book** | |
|  | Mark Lutz, Programming Python, O`Reilly, 4th Edition, 2010 |
|  | Antonio Mele, Django By Example, 2015 |
| **Refererence Manual** | |
|  | NumPy Reference Manual |

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| **Course Outcomes (COs)** | | |
| At the end of the course, the student will be able to | | Bloom’s Level |
| 1. | Explain basic principles of Python programming language | L2 |
| 2. | Apply object oriented concepts, database and develop GUI applications. | L3 |
| 3. | Develop applications using Numpy and SciPy packages | L3 |

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| **Program Outcome of this course (POs)** | | PO No. |
| 1. | Design/development of solutions: Design solutions for complex engineering problems and design system components or processes that meet the specified needs with appropriate consideration for the public health and safety, and the cultural, societal, and environmental considerations. | PO3 |
| 2. | Modern tool usage: Create, select, and apply appropriate techniques, resources, and modern engineering and IT tools including prediction and modeling to complex engineering activities with an understanding of the limitations. | PO5 |
| 3. | Life-long learning: Recognize the need for, and have the preparation and ability to engage in independent and life-long learning in the broadest context of technological change. | PO12/PO1 |

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| **Course Delivery methods Assessment methods**   1. Chalk and board 1. Project 2. PPT 2. Experiments 3. Video lectures |

**Scheme of Continuous Internal Evaluation (CIE):**

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| Components | Project | Experiments | Class participation | Total  Marks |
| Maximum Marks: 25 | 10 | 10 | 5 | 25 |

Minimum marks required to pass in CIE: 50% of Maximum Marks

A team of 3 students needs to formulate a problem definition in consultation with the guide for the Project component and work towards completion after approval.

Experiments from the approved list need to be executed by the students for the Experiments component.

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| **Scheme of Semester End Examination (SEE):** | |
| 1. | It will be conducted for 50 marks of 3 hours duration and will be scaled down to 25 marks for the calculation of SGPA and CGPA. |
| 2. | Minimum marks required in SEE to pass: 40% of Maximum Marks |
| 3.  4. | Student has to execute one experiment based on lots.  Change of experiment is permitted only twice and within the first half an hour of the commencement of the exam. A student cannot revert to the original experiment after change. 20% of the marks would be deducted for change of experiment. |

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| Components | Experiment  Write-up | Experiment  Execution | Project  Viva | Total  Marks |
| Maximum Marks: 50 | 10 | 30 | 10 | 50 |

**List of Experiments**

1. Develop and execute an Object Oriented program in Python using basic data structures like arrays and dictionaries.
2. Develop and execute an Object Oriented program in Python to demonstrate inheritance and polymorphism.
3. Develop and execute an Object Oriented program in Python to demonstrate database connectivity.
4. Develop and execute an Object Oriented program in Python using file I/O and exception handling.
5. Develop a program in Python to demonstrate the use of the numPy/Panda package.
6. Develop a program in Python to demonstrate the use of the numPy/Panda package.
7. Develop a program in Python to demonstrate the use of the numPy/Panda package.
8. Develop a program in Python to demonstrate the use of the numPy/Panda package.