

Kadi Sarva Vishwavidyalaya, Gandhinagar
MASTERS OF COMPUTER APPLICATION (MCA)
Year – III (Semester – V) (W.E.F. June 2015)

Subject: Programming using Open Source - MCA-504(C)

Sub Total Credit	Teaching scheme		Examination scheme				
	(per week)		MID	CEC	External		Total Marks
	Th	Pr	Th	Th	Th.	Pr.	
5	3	4	25	25	50	50	150

Course Description:

The objective of this course is based on understanding Overview, Tools, Technology and Applications. The development of applications in diversified domains is to be carried out in python environment and their allied tools.

Learning Objectives:

Students will learn to program in interactive mode for initial development with lot of time saving in development resulting in lesser development cost with:

- high speed matrix operations
- advance data structures in-built to the system
- efficient graphics and visualization
- high performance code optimization and executions

Prerequisites :

- Knowledge of Programming languages such as C, JAVA and .NET
- Analysis of coding complexities.

Unit 1 : About Python

- **Python language:** Components of the Python language System, Using Python in interactive mode with basic operations and built-in functions.
- **Built-in Data Types, Variables, expressions and statements :** Core Native Data Types, inf and NaN, Floating point precision, Variable Names, Values and types, keywords, Operators, Expressions and statements, Order of Operations, String operations, Comments.
- **Arrays and Matrices :** 1-dimensional Arrays, 2-dimensional Arrays, Multidimensional Arrays, Array Operations, Array and Matrix Functions- Views, Shape Information and Transformation, Linear Algebra Functions, Structured Arrays - Mixed Arrays with Column Names, Record Arrays.

Unit II: Programming Basics

- **Flow Control, Loops / Iteration :** if . . . elif . . . else, for, while, break, Exception Handling - try . . . except.
- **String Manipulation :** String Building, String Functions, Formatting Numbers, Regular Expressions, Conversion of Strings.
- **Functions :** Basic Functions - Rounding, Mathematical, Complex Values, Set Functions, Sorting, Nan Functions , Type conversion functions, Dates and Times Functions - Creating Dates and Times, Dates Arithmetic, Customs functions, Modules and Packages, recursion.

Unit III: Programming Advance Features

- **Lists** : Properties, Operations, Traversing, Slicing, Methods, Deleting elements, Map, filter and reduce, Lists and strings, Objects and values, Aliasing, List arguments.
- **Dictionaries** : properties, Operations, Methods, Memos, Global variables, Long integers.
- **Tuples** : Properties, Operations, Methods, return values, Variable-length argument tuples, Lists and tuples, Dictionaries and tuples, Comparing tuples, Sequences of sequences.
- **Graphics** : 2D Plotting, Advanced 2D Plotting, 3D Plotting, Exporting Plots, Data Analytics and Visualization.

Unit IV: Files and File System

- **Files Operations:** Persistence, Reading and writing, Format operator, Filenames and paths, Writing modules, Catching exceptions, Databases, Pickling, Pipes.
- **File System Operations** : Creating, Changing and Deleting Directories, Listing contents of Directory, Copying, Moving and Deleting Files.

Unit V: High Performance Coding and Execution

- **Object Oriented Programming (OOP) and GUI** : Classes and objects, Classes and functions, Classes and methods, Inheritance, Database Connectivity and simple network programming.
- **GUI Development** : Buttons and callbacks, Canvas widgets, Coordinate sequences, More widgets, Packing widgets, Menus and Callables, Binding, Card objects.
- **Code Optimization** : Timing Code, Vectorization for Unnecessary Loops, loop dimension alternations, broadcasting alternations, In-place assignment uses, inline function frequent calls, consideration of data locality in Arrays.
- **Code Executing in Parallel** : Converting a Serial Program to Parallel, multiprocessing, map and related functions, Python's Parallel Cluster, Parallel execution related concerns.

Reference Books:

- Parallel Programming with Python by Jan Palach.
- Practical Programming - an Introduction to Computer Science Using Python by Jennifer Campbell, Paul Gries, Jason Montojo, Greg Wilson.
- Fundamentals of Programming Python by Richard L. Halterman.
- Minecraft Pi Book, by Craig Richardson.
- Laboratory Manual for Computer Programming with Python and Multisim™, by James M. Fiore.
- FOSS Lab Manual.
- Rapid GUI Programming with Python and Qt by Mark Summerfield.
- Python Cookbook, by David Ascher, Alex Martelli, Anna Ravenscroft.
- Python Programming for Absolute Beginner by Michael Dawson.
- Introduction to Python for Econometrics, Statistics and Data Analysis by Kevin Sheppard.
- A Comprehensive Introduction to Python Programming and GUI Design Using Tkinter by Bruno Dufour (McGill).
- Learning to program with python by Richard L. Halterman.
- Learning to Program Using Python by Cody Jackson.

Continuous Evaluation Management (Internal Marks) (Programming using Open Source-MCA504(C))

The continuous evaluation will be organized as follows:

Project : There will be one mini project to be developed and documented by each student solving a real life problem and developing acceptable/innovative solution. This documentation in a form of mini project report with core elements of Introduction, Study analysis of existing systems/projects, technology and tools in use with justification, Proposed innovative solution, development and implementation platform, Testing with Results. Student can take a project in the area of **Cyber Security, Digital Forensic, Image Processing, Data Analytics with Visualization, High Performance Computing, High Performance Networking & Services, Cloud Computing and Services etc.**

Internal Marks : The final internal marks will be obtained on the basis of the quality of the seminar, participation in the class discussion, and the quality of the project report. Students are encouraged to join in the class discussion and present their thoughts and ideas on the all varied aspects of programming paradigms and applied dimensions.

Hands-on Development Domain:

- Python OS variants 2.X or 3.X (latest available version).
- Computing with numpy, scipy, matplotlib.
- GUI with QT / Tk.
- Python tools for code optimization and parallel processing.

Hands-on Development Sessions:

- Setting Up of Python environment with relevant tools on Windows / Other O.S.
- Programming in Interactive Step Mode using commands, functions and programming elements.
- Programming in Script Mode.
- Extensive use of Lists and Dictionaries in python utility programs.
- Writing functions and building library of developer needed utility functions.
- Exception Handling, Files and File systems programming.
- Software Objects and Object Oriented Programming.
- Graphics and Image processing.
- Data Analytics and Visualization.
- GUI development.
- Database integrated Web services utility program development.
- High Performance/Throughput computing with Parallel Processing.