Lecture Plan

Name of the College: Government College of Arts, Science and Commerce, Sanquelim-Goa

Name of Faculty: Aaron Alphonso	**Subject:** Mathematics

Paper code: MAT-528 - Computational Mathematics Using Python	**Program:** M.Sc. Mathematics	**Division:** -

Academic year: 2024-25	**Semester:** II	**Total Lectures:** 60

Course Objectives: The student will learn the basics of python programming

Expected Course Outcome: On completion of the course the student will be familiar with loops, Functions, Recursion, Object Oriented Programming

Student Learning Outcome: At the end of this course a student will be able to
1. Recall the various concepts and techniques in Python.
2. Use the concepts learnt in Python to write basic programs.
3. Apply the knowledge in python to solve writing programs useful in mathematics.
4. Correlate the concepts of mathematics with python to solve problems in Mathematics.

Month	Lecture From	Lecture To	No. of lectures allotted	Topic, Subtopic to be covered	Exercise/ Assignment	ICT Tools	Reference books
December	4 Dec 2024	7 Dec 2024	2	**Introduction to Python:** IDLE , Python strings, Relational Operators, Logical Operators, Precedence of Operators, Variables and assignment statements, Keywords, Script mode	Programming assignments	Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar
December	9 Dec 2024	14 Dec 2024	4	**Functions:**Built-in functions; input, eval, composition, print, type, round, min, max, pow Type conversion, Random number generation; randint Functions from math module, complete list of Built-in functions using help and dir	Programming assignments	Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar
December	16 Dec 2024	21 Dec 2024	2	**Functions:** Function Definition and call, fruitful and void functions, function help, default parameter values, keyword arguments Importing User-defined modules, Assert statement.	Programming assignments	Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar
January	2 Jan 2024	4 Jan 2025	2	**Control Structures:** General form of if , if-else , if-elif-else conditional statement Nested if-elif-else conditional statement. For and While statements and their	Programming assignments	Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja

				comparison, Nested loops, Break, Continue, Pass statements Else statement associated with a For/While statement Testing, Debugging			and Naveen Kumar
January	6 Jan 2025	11 Jan 2025	4	**Scope of Variables/Names:**Objects and Object ids, Namespaces; Global and Local variables, LEGB Rule **Strings:** Slicing, membership, basic functions and methods on strings.	Programming assignments	Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar
January	13 Jan 2025	18 Jan 2025	4	**Mutable and Immutable:** Objects Lists, functions and methods on lists, List comprehension, copying lists, Sets, functions and methods on sets	Programming assignments	Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar
January	20 Jan 2025	25 Jan 2025	4	**Mutable and Immutable:** Tuples, functions and methods on tuples, Dictionary, dictionary operations, functions.	Programming assignments	Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar

January - February	27 Jan 2025	1 Feb 2025	4	**Recursion:**Iterative Approach and recursive approach, Program to find Minors and Determinant of a matrix.		Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar
					Programming assignments		
February	3 Feb 2025	8 Feb 2025	4	**Files and Exceptions:** File handling, writing structures to a file, exceptions		Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar
					Programming assignments		
February	10 Feb 2025	15 Feb 2025	4	**Classes and Objects:** Class attributes, class variables, destructor, Person, Graphs: as an example of a class		Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar
					Programming assignments		
February	17 Feb 2025	22 Feb 2025	4	**Classes and Objects:** Highest degree and least degree, operator overloading, instance method, static method, composition and inheritance.		Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar
					Programming assignments		
February - March	24 Feb 2025	1 Mar 2025	4	**Graphics:** 2D graphics, mathplotlib, matplotlib installation, points, lines.	Programming assignments	Laptop, Smart Board	Python Programming: A Modular

							Approach by Sheetal Taneja and Naveen Kumar
March	3 Mar 2025	8 Mar 2025	4	**Practical 1:** Expressing the elements of the Symmetric group as a product of disjoint cycles.	Programming assignments	Laptop, Smart Board	
March	10 Mar 2025	15 Mar 2025	2	**Practical 2:** Characteristic Equation of a nxn matrix. Synthetic Division to find rational roots of a polynomial when rational roots exist. **Practical 3:** Row Reduction to (Reduced)Row Echelon form. Generating nxn Identity Matrix Inverse of a matrix using row reduction	Programming assignments	Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar
March	17 Mar 2025	22 Mar 2025	4	**Practical 4:** Finding Basis for the Row Space, Column Space of a matrix A and solution space of AX=B. **Practical 5:** Havel and Hakimi's Algorithm for degree sequences.	Programming assignments	Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar
March	24 Mar 2025	29 Mar 2025	4	**Practical 6:** Solutions of linear Diaphontine Equations	Programming assignments	Laptop, Smart Board	Python Programming: A Modular Approach by

							Sheetal Taneja and Naveen Kumar
March - April	31 Mar 2025	5 Apr 2025	4	**Practical 7:** Fitting of straight line and quadratic curve to given data	Programming assignments	Laptop, Smart Board	Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar

* Assessment Rubrics

Component	Max Marks
ISA 1	10
ISA 2	10
ISA 3	10
ISA 4	10
Semester End Exam	20