# Lecture Plan

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

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| **Name of Faculty:** Rohit Redkar | **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 |
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| 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 | Programming assignments | Laptop, Smart Board | Python Programming: A Modular Approach by Sheetal Taneja |

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| | | | | their 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<br>**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 |

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| January - February | 27 Jan 2025 | 1 Feb 2025 | 4 | **Recursion:**Iterative Approach and recursive approach, Program to find Minors and Determinant of a matrix. | Programming assignments | Laptop, Smart Board | Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar |
| February | 3 Feb 2025 | 8 Feb 2025 | 4 | **Files and Exceptions:** File handling, writing structures to a file, exceptions | Programming assignments | Laptop, Smart Board | Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar |
| February | 10 Feb 2025 | 15 Feb 2025 | 4 | **Classes and Objects:** Class attributes, class variables, destructor, Person, Graphs: as an example of a class | Programming assignments | Laptop, Smart Board | Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar |
| 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. | Programming assignments | Laptop, Smart Board | Python Programming: A Modular Approach by Sheetal Taneja and Naveen Kumar |

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| 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.<br><br>**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.<br><br>**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 |

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| 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 |
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| ISA 1 | 10 |
| ISA 2 | 10 |
| ISA 3 | 10 |
| ISA 4 | 10 |
| Semester End Exam | 20 |