Semester V
Applied Component
Course : Computer Programming and System Analysis I
Course Code: RUSACMAT501

Unit 1 : Introduction to Python

i. A brief introduction about Python and installation of anaconda.

ii. Numerical computations in Python including squareroot, trigonometrical functions using math and cmath module. Different data types in Python such as list, tuple and dictionary.

iii. If statements, For loop and While loops and simple programmes using these.

iv. User-defined functions and modules. Various use of lists, tuple and dictionary.

v. Use of Matplotlib to plot graphs in various format.

Unit 2 : Advanced topics in Python

i. Classes in Python.

ii. Use of Numpy and Scipy for solving problems in linear algebra and calculus, differential equations.

iii. Data handling using Pandas.

Unit 3 : Introduction to SageMath

i. Sage installation and use in various platforms. Using SageMath as an advanced calculator.

ii. Defining functions and exploring concept of calculus.

iii. Finding roots of functions and polynomials.

iv. Plotting graph of 2D and 3D in SageMath.

v. Defining vectors and matrices and exploring concepts in linear algebra.

Unit 4 : Programming in SageMath

i. Basic single and multi-variable calculus with Sage.

ii. Developing Python programmes in Sage to solve same problems in numerical analysis and linear algebra.

iii. Exploring concepts in graph theory and number theory.

Semester VI
Applied Component
Course : Computer Programming and System Analysis II
Course Code: RUSACMAT601

Unit 1 : Introduction to SciLab

i. Basic introduction to SciLab, using SciLab as an advanced calculator.

ii. Defining vectors and matrices and basic operations.

iii. Plotting graphs of 2D and 3D in various forms.

iv. Exploring concept of calculus using SciLab.

v. Solving ODE in SciLab.

Unit 2 : Programming in SciLab

i. If -Else conditions, loops, user-defined function, etc.

ii. Developing programmes to find roots and algebraic and transcendental equation and solving system of linear equations (Gaussian Elimination Method , Gauss-Jacobi Method and Gauss-Siedel Method).

iii. Exploring applied linear algebra using SciLab (eigenvalues, eigenvectors and various properties, applications to solve ODE, matrix factorization and its applications).

Unit 3 : Introduction to LaTeX

i. Introduction,document structure - creating title, sections, table of contents, labelling.

ii. Typesetting text - fonts, text colour, lists.

iii. Tables, equations.

Unit 4 : Presentation using slides and articles

i. Layout of page, cross references.

ii. Footnotes, definitions ?

iii. Page style, presentation slides.

Reference Books :

(1) SciLab Textbook Companion For Higher Engineering Mathematics, B. S. Grewal.

(2) SciLab Textbook Companion For Linear Algebra and Its Applications, D. C. Lay.

(3) SciLab Textbook Companion For Numerical Methods, E. Balguruswamy.

(4) Introduction to SciLab, Sandeep Nagar, Apress.