

GHAR SE CODE {

SciPY Syllabus:-

Course Title: SciPy

Course By: GSC (GHAR SE CODE)

Duration: 25 Hrs

Code Spirit: “Know the Domain, Not Just the Function”

Module	Topic	Detailed Overview
1	Introduction to SciPy	- What is SciPy and how is it different from NumPy?- Installing and importing- SciPy ecosystem and sub-packages overview
2	Working with scipy.special	- Special mathematical functions- Gamma functions, Bessel functions, erf, beta, etc.- Use in probability and physics
3	Optimization with scipy.optimize	- Minimization (minimize, fmin, fmin_bfgs)- Root finding: root(), fsolve()- Curve fitting with curve_fit()
4	Integration with scipy.integrate	- Definite and indefinite integration- quad(), dblquad(), tplquad()- Solving ordinary differential equations (ODEs) with solve_ivp()
5	Linear Algebra with scipy.linalg	- Matrix decomposition: LU, QR, SVD- Solving linear systems- Matrix inversion, norms, eigenvalues
6	Interpolation with scipy.interpolate	- 1D & 2D interpolation- interp1d, griddata, splrep, splev- Use in time series and spatial data
7	Statistics with scipy.stats	- Probability distributions (PDF, CDF, random sampling)- Descriptive statistics: mean, median, std, skew, kurtosis- Hypothesis testing: t-test, chi-square, ANOVA
8	Signal Processing with scipy.signal	- Filtering signals (low-pass, high-pass)- FFT and convolution- Peak finding and signal smoothing
9	Image Processing with scipy.ndimage	- Reading and manipulating image arrays- Filters (Gaussian, Sobel, Laplace)- Measurements, labeling regions

Module	Topic	Detailed Overview
10	Sparse Matrices with <code>scipy.sparse</code>	- Creating sparse matrices- Operations on sparse matrices- Performance benefits and memory efficiency
11	File I/O with <code>scipy.io</code>	- Reading and writing .mat files- Working with .wav, .arff, and binary formats- Integration with NumPy arrays
12	Capstone / Applications	- Apply multiple SciPy modules to solve a real-world problem- Examples: signal filtering, optimization in physics, curve fitting in finance, etc.

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