ST. XAVIER'S COLLEGE (AUTONOMOUS), AHMEDABAD-9
FACULTY OF SCIENCE

DEPARTMENT OF PHYSICS & ELECTRONICS

SEMESTER – III

SYLLABUS

OF

BSc PHYSICS (HONOURS)

BASED ON UNDERGRADUATE CURRICULUM FRAMEWORK
(NEP – 2020)

(Effective from Academic Year 2023)

Curriculum Framework for Semester – III

Course	Title	Content		Credit
DSC-5 (Theory)	PHMC331C Solid State Physics and Classical Mechanics	U1	Interatomic Forces and Bonding Force in Solids, The crystalline State.	4
		U2	Lattice Vibrations, Thermal properties	
		U3	Lagrangian Formulation, Motion of a rigid body	
		U4	Classical Mechanics, Moving Coordinate System	
DSC-6 (Theory)	PHMC332C Optics and Instrumentations	U1	Diffraction and Resolving power	4
		U2	Polarization	
		U3	Lasers	
		U4	Instruments	
DSC-7 (Laboratory)	PHMC333L Physics and Experiential Lab-III	14 Physics Experiments		4
		Experiential Lab: Hands on experiment.		
SEC	PHSE331C Physics Analysis using Python	U1	Introduction to Python Programming.	2
		U2	Python Laboratory	
MDC	MDC206C Astronomy for Beginners	U1	Intr. to Astronomy and Observations in Astronomy	4
		U2	Principles and Tools for Observations in Astronomy	
		U3	Celestial Objects and Their Nature	
		U4	Field Trip/Project/Stargazing	
AEC	Ability Enhancement Course	(To be offered by the concerned subject Department)		2
VAC	Value Added Course	(To be chosen from a basket of courses)		2
Total Credits				22

St. Xavier's College (Autonomous), Ahmedabad

Syllabus of Semester–III to be implemented from the Academic Year **2025-26.**

DEPARTMENT OF PHYSICS & ELECTRONICS

SEC Course: Physics Analysis using Python						
Course Code & Title	**Cr**	Lecture hrs	Tutorial hrs	Activity/Case study analysis	**Eligibility Criteria**	**Prerequisite(s) of the Course (if any)**
PHSE331C Physics Analysis using Python	4	12 × 4	3 × 4		10 + 2 from a recognized board	Science Stream Math-Group

Learning Objectives:

LO1	Develop Python programs using conditionals, loops, data structures (lists, tuples, dictionaries), and implement file and error handling mechanisms.
LO2	Use NumPy for efficient numerical operations and create data visualizations using Matplotlib, including line graphs, scatter plots, and histograms

Course Outcomes:

CO1	Demonstrate proficiency in core Python programming concepts including variables, data types, control structures, functions, and modules for solving basic computational problems.
CO2	Apply Python libraries such as NumPy and Matplotlib for numerical computation and data visualization in scientific applications.

Unit 1: Python

Credit of Course: 1 Cr **Lecture 12 Hrs** **Tutorial 3Hrs**

[A] Introduction to Python Programming. Variables, Data Types, and Operators. Control Structures: Conditionals. Control Structures: Loops. Data Structures: Lists and Tuples. Data Structures: Dictionaries and Sets. Functions and Modules. File Handling. Error Handling and Exception Handling. Introduction to NumPy. Introduction to Matplotlib. Introduction to SciPy.

Text Book:

[A] Learn Python 3 the Hard Way – Zed A. Shaw, Exercises 0 – 10, 16 – 21, 29 – 33, 38 – 40

[B] Numerical Python: Scientific Computing and Data Science Applications with Numpy, SciPy and Matplotlib – Robert Johansson (2nd Edition), Chapters 2, 4

Unit 2: Laboratory Component

Credit of Course: 1 Cr **Lecture 12 Hrs** **Tutorial 3Hrs**

[A] Setting Up Python Environment: Installing Python and required libraries

[B] Python Basics and Simple Programs: Writing simple Python programs to perform arithmetic operations, string manipulations, and basic logic.

[C] Conditional Statements and Loops: Implementing various conditional statements and loop structures in Python

[D] Working with Lists, Tuples, and Dictionaries: Hands-on exercises on list manipulations, tuple operations, and dictionary operations

[E] Functions and Modules: Writing and calling functions, exploring the concept of modules and packages

[F] File Handling: Reading from and writing to files, handling different file formats

[G] Error Handling: Identifying and handling errors in Python programs using try-except blocks

[H] Introduction to NumPy: Creating NumPy arrays, performing basic array operations and manipulations; Exploring advanced NumPy functionalities like array manipulation, broadcasting and universal functions

[I] Data Visualization with Matplotlib: Creating various types of plots (line plots, scatter plots, histograms) using Matplotlib.

Text Book:

[A] Learn Python 3 the Hard Way – Zed A. Shaw, Exercises 0 – 10, 16 – 21, 29 – 33, 38 – 40

[B] Numerical Python: Scientific Computing and Data Science Applications with Numpy, SciPy and Matplotlib – Robert Johansson (2nd Edition), Chapters 1-5, 6-7