

T K M COLLEGE OF ARTS AND SCIENCE KOLLAM

DEPARTMENT OF PHYSICS

CERTIFICATE COURSE ON

PYTHON IN PHYSICS

ACADEMIC YEAR 2023-2024

**COURSE COORDINATOR
Dr. ANSHAD A
ASSISTANT PROFESSOR**

PY 2302 Python in Physics

(30 hours)

Course Overview

This course introduces the fundamental concepts of Python programming, focusing on their applications in physics. It is designed for beginners with no prior programming experience. Through hands-on exercises and simple physics-based examples, students will learn Python programming essentials and develop the skills to solve basic physics problems. The course covers core Python concepts like syntax, data structures, loops, functions, and basic numerical methods, which are essential for using Python in physics contexts.

Course Objectives

- Understand basic Python programming concepts and syntax.
- Use Python to perform fundamental physics calculations and simple simulations.
- Work with Python's data structures (lists, dictionaries, etc.) to manage and manipulate data.
- Apply Python's control structures to model physical phenomena.
- Develop basic problem-solving skills using Python in physics contexts.

Detailed Syllabus

Module 1: Introduction to Python Programming (6 hours)

- **Overview of Python:** Introduction to Python, its uses in physics, and its role in scientific computing.
- **Installing Python and Setting Up the Environment:** Installation of Python, basic IDEs (VS Code, Jupyter Notebook), and environment setup.
- **Basic Python Syntax:** Writing your first Python script, understanding indentation, variables, and data types.
- **Data Types and Variables:** Introduction to integers, floats, strings, and booleans. Basic operations on variables (addition, subtraction, multiplication, etc.).

Module 2: Control Structures and Functions (6 hours)

- **Conditional Statements:** if, elif, else—using conditions to make decisions in your program.
- **Loops:** Introduction to for and while loops to repeat tasks (e.g., iterating over data points, performing repetitive calculations).
- **Functions:** Defining simple functions to structure your code, understanding parameters and return values.
- **Applying Control Structures in Physics:** Using loops and conditions to simulate basic physics problems (e.g., computing distance, velocity, or time).

Module 3: Python Data Structures for Physics (6 hours)

- **Lists:** Creating, modifying, and using lists for storing numerical data, such as position, time, or velocity.
- **Tuples:** Introduction to tuples and their use in storing immutable data.
- **Dictionaries:** Using dictionaries to store and access physical constants, formulas, or other essential parameters.
- **Data Manipulation:** Basic operations to manage and manipulate physical data (e.g., calculating average velocity, storing time steps).

Module 4: Basic Numerical Methods for Physics (6 hours)

- **Introduction to Numerical Methods:** Understanding the importance of numerical solutions for physical problems (e.g., integration and differentiation).
- **Using Lists and Loops for Numerical Calculations:** Simulating simple physical systems (e.g., calculating the position of a moving object over time).
- **Plotting and Visualizing Data:** Introduction to data visualization with basic plotting (using matplotlib or other simple plotting libraries) to display graphs of physical data.
- **Applications:** Solving problems like calculating the trajectory of a projectile or the displacement of an object in motion.

Module 5: Introduction to Simple Simulations (6 hours)

- **Simulating Physical Systems:** Writing Python code to simulate basic systems in physics (e.g., a falling object under gravity).
- **Example: Motion of an Object:** Using loops and lists to simulate the motion of an object under constant acceleration.
- **Simulating Oscillations:** Simple introduction to simulating simple harmonic motion (e.g., a mass on a spring).
- **Basic Energy Calculations:** Simulating energy exchanges in simple systems, like calculating kinetic and potential energy.

Module 6: Review and Final Application (6 hours)

- **Review of Core Concepts:** Recap of Python basics, data structures, loops, functions, and simple numerical methods.
- **Final Application:** Students will solve a basic physics problem using the Python concepts learned in the course (e.g., simulating projectile motion, calculating the period of a pendulum).
- **Course Wrap-Up:** Summary of the course, next steps in Python learning, and introduction to more advanced topics (e.g., simulations, numerical solvers).

Teaching Methodology

- **Lectures:** Interactive lessons with explanations of core Python concepts.
- **Hands-On Practice:** Practical coding exercises focused on physics problems.
- **Group Exercises:** Collaboration on small exercises and problems to reinforce learning.
- **Self-Study:** Recommended readings and exercises for independent practice.
- **Assignments:** Weekly assignments based on the course topics.

Assessment Plan

- **Module Quizzes:** Short quizzes after each module (15%).
- **Assignments:** Weekly hands-on coding exercises and problem-solving assignments (40%).
- **Final Project:** A final task that requires applying Python to solve a simple physics problem (30%).
- **Participation:** Active involvement in class discussions and exercises (15%).

Course Outcome

By the end of the course, students will:

- Be able to use Python to solve basic physics problems involving numerical methods, data manipulation, and simple simulations.
- Understand the role of Python in scientific computing and its application in solving physical problems.
- Be proficient in writing Python code to simulate simple physical systems and visualize data.
- Have a solid foundation to explore more advanced topics in computational physics.

Reference Textbooks

1. **"Python for Physics"** by David L. O'Brien (beginner-friendly introduction to Python for physics students).
2. **"Python Programming for the Absolute Beginner"** by Michael Dawson (a general Python programming book with examples applicable to physics).
3. **"A Student's Guide to Python for Physical Modeling"** by Jesse M. Kinder and Philip Nelson (focuses on using Python for basic physical modeling).
4. **"Computational Physics: Problem Solving with Python"** by Mark Newman (introductory concepts and examples focused on Python in physics).
5. **Official Python Documentation:** Python Docs



Certificate Course

Offered By Department Of Physics,
TKM College Of Arts & Science Kollam

PYTHON IN PHYSICS

Attendance statement

Course on Python in Physics S3 and S4 BSc Batch – Academic Year 2023-24

Class time: 9:30 am to 3:30 pm

Sl. No:	Name of student	13-05-24	14-05-24	15-05-24	20-05-24	21-05-24	22-05-24
1	Afna S Thaha	P	P	P	P	P	P
2	Akhila R	P	P	A	P	P	P
3	Aromal Biju	P	P	P	P	P	P
4	Asna S	P	P	P	P	P	P
5	Bhagyalekshmi N	P	P	P	A	P	P
6	Greeshma R Gopan	P	P	P	P	P	P
7	Hiba Raj	P	A	P	P	P	P
8	Kavya B	P	P	P	P	P	P
9	Mahasin Sabu	P	P	P	P	P	a
10	Riya Baiji	P	P	P	P	P	P
11	Sulthana B S	P	P	P	P	P	P
12	ADARSH A	P	P	P	A	P	P
13	Adarsh V	P	P	P	P	P	P
14	Adithyan P R	A	P	P	P	P	P
15	AJIN JOSE	P	P	P	P	P	P
16	Devendra Nath V	P	P	P	P	A	P
17	Fathima A	P	P	P	P	P	P
18	Fazna M Niyas	P	P	P	P	P	P
19	Khansa N	P	P	P	P	P	P
20	KRISHNA RAJU	P	A	P	P	P	P
21	MOHAMED ADHIL S	P	P	P	P	P	P
22	Mohammed Althaf A	P	P	P	P	P	P
23	Muhammed Hashim S	P	P	P	P	P	A
24	Nada Fathima T K	P	P	P	P	P	P
25	Nidha Neshar	P	P	P	P	P	P
26	Nishad N	P	P	P	P	P	P
27	Sahil H	P	P	P	P	P	P
28	SWATHY MANASA B	P	P	P	P	A	P
29	V Anu Rajeev	P	P	P	P	P	P
30	Aliya Najumuddin	A	P	P	P	P	P

Course coordinator: Dr. Anshad A
Assistant professor

Course on Python in Physics
S3 and S4 BSc Physics Batch-Academic Year 2023-24
Report on Certificate Course

Department of Physics TKM College of Arts & Science conducted 30 Hr. Certificate Course on “**Python in Physics**”. A total of 30 students of S3 and S4 BSc Physics students were enrolled in the course. The course coordinator was Dr. Anshad A. The classes are handled by Dr. Anshad A, Dr. Mohammed Salim and Aparna L R (Assistant Professors, and Department of Physics, T K M College of Arts and Science). The classes started on 13-05-2024. Each day contains 5 teaching hours. Both theory as well as practical sessions were arranged. An assessment test - coding on simple problems-was conducted on 24-05-24 for issuing certificates. All the students successfully completed the certificate course.

Grades :

90% and above - A Grade

80-89% - B Grade

70-79% - C Grade

60-69% - D Grade

11 students secured A grade, 6 students secured B grade, 3 students secured C Grade and 10 students secured D grade.

Course coordinator: Dr. Anshad A, Assistant professor, Department of Physics

Programme coordinator: Dr. Mohammed Salim, Assistant professor, Department of Physics

Python in Physics

S3 and S4 BSc Physics Batch-Academic Year 2023-24 Grade Sheet

Sl. No:	Name of Student	Candidate Code	Grade
1	Aromal Biju	23022142003	D
2	Afna S Thaha	23022142001	C
3	Akhila R	23022142002	D
4	Asna S	23022142004	A
5	Bhagyalekshmi N	23022142005	D
6	Greeshma R Gopan	23022142006	A
7	Hiba Raj	23022142007	A
8	Kavya B	23022142008	A
9	Mahasin Sabu	23022142009	A
10	Riya Baiji	23022142010	A
11	Sulthana B S	23022142012	D
12	ADARSH A	23022142013	B
13	Adarsh V	23022142014	D
14	Adithyan P R	23022142015	D
15	AJIN JOSE	23022142016	B
16	Devendra Nath V	23022142018	D
17	MOHAMED ADHIL S	23022142023	B
18	Mohammed Althaf A	23022142024	D
19	Muhammed Hashim S	23022142025	D
20	Nishad N	23022142028	C
21	Sahil H	23022142029	C
22	V Anu Rajeev	23022142031	D
23	Fathima A	23022142019	B
24	Fazna M Niyas	23022142020	A
25	Khansa N	23022142021	A
26	KRISHNA RAJU	23022142022	A
27	Nada Fathima T K	23022142026	A
28	Nidha Neshar	23022142027	B
29	SWATHY MANASA B	23022142030	A
30	Aliya Najumuddin	23022142032	B

Academic Year 2023-24

BSc physics 2022-25 Batch [S3/S4]

62

PY 2302 Python In Physics.

Sl No:	Admn.No:	Candidate code	Name	Signature
1.	58680	23022142003	Aromal Beju	<i>Aromal</i>
2.	58931	23022142001	Afna S Tharba	<i>Afna</i>
3.	58923	23022142002	Akhila R	<i>Akhila</i>
4.	58461	23022142004	Asna S.	<i>Asna</i>
5.	59051	23022142005	Bhagyalekshmin	<i>Bhagyalekshmin</i>
6.	58455	23022142006	Greeshma R Chopan	<i>Greeshma</i>
7.	58469	23022142007	Hiba Raj	<i>Hiba Raj</i>
8.	58607	23022142008	Kavya B	<i>Kavya</i>
9.	58783	23022142009	Mahasin Sabu	<i>Mahasin Sabu</i>
10.	58457	23022142010	Riya Baiji	<i>Riya</i>
11.	58937	23022142012	Sulthana BS	<i>Sulthana</i>
12.	58610	23022142013	Adarsh A	<i>Adarsh</i>
13.	58697	23022142014	Adarsh V	<i>Adarsh</i>
14.	58688	23022142015	Adithyan PR	<i>Adithyan</i>
15.	58942	23022142016	Ajin Jose	<i>Ajin</i>
16.	58947	23022142018	Devendranath V	<i>Devendranath</i>
17.	58885	23022142023	Mohamed Adhils	<i>Mohamed</i>
18.	58702	23022142024	Mohamed Althaf	<i>Mohamed</i>
19.	58977	23022142025	Muhammed Hashims	<i>Muhammed</i>
20.	58829	23022142028	Nishad N	<i>Nishad</i>
21.	58821	23022142029	Sahil H	<i>Sahil</i>
22.	58701	23022142031	V Ann Rajeev	<i>V Ann</i>
23.	58986	23022142019	Fathima A	<i>Fathima</i>
24.	58801	23022142020	Fazna M Niyas	<i>FAZNA</i>
25.	58820	23022142021	Khansa N	<i>Khansa</i>
26.	58465	23022142022	Krishna Raju	<i>Krishna</i>
27.	58839	23022142026	Nada Fathima TK	<i>Nada</i>
28.	58824	23022142027	Nidha Nesbar	<i>Nidha</i>
29.	58605	23022142030	Swathy Manasa B	<i>Swathy</i>
30.	58693	23022142032	Aliya Najmuddin	<i>Aliya</i>

[Signature]
APARNA L.R
 Assistant Professor & Head Department of Physics
 TKM College of Arts and Science
 Kollam-5
 Phone: 691005

