

Course Title: Python Learning with Turtle Graphics –

Level 1

Course Description: This course provides a comprehensive introduction to Python programming and Python Turtle graphics. It covers the basic concepts of programming and gradually progresses to more advanced topics, equipping students with the skills to develop Python applications by using Python Turtle.

Course Duration: 33 weeks (1 hours per session, 1 session per week)

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Class Time: Sunday 5pm-6pm

- Meeting ID: 889 7143 9016
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Prerequisites:

- No prior programming experience is required.
- Windows 10/11 laptop or desktop.

Course Syllabus:

Week 1: Introduction to Python

- Introduction to programming
- Why Python?
- What can Python do?
- Setting up the development environment (Python installation, text editor/IDE)
- Running Simple Python programs
- 3 Core Parts of Programming

Week 2: Python Basics 1 – Data Type and Variables

- Basic Python syntax
- What is data type
- Simple data type
- Collection data type
- Variables

Week 3: Python Basics 2 - Operators

- Operators
- Math operators
- Bitwise operators
- Assign and equal
- Comments
- Input and Output

Week 4: Introduction to Turtle Graphics

- Introduction to Turtle Graphics and its features
- Two-dimensional Plane
- Directions and degrees on 2-D plane
- Basic Turtle commands: forward, backward, left, right, penup, pendown
- Drawing simple shapes (lines, squares, circles)

Week 5: Colors and Filling

- Using colors in Turtle Graphics
- Choose color by name
- Choose color by RGB value
- Drawing shapes with different colors
- Filling shapes with colors
- Creating gradients and patterns

Week 6: Control Flow 1 – Conditional Statements

- Conditional statements (if, elif, else)
- TRUE and FALSE cases
- Apply conditional statements in Python Turtle
- Turtle graphics workshop using if/else statements

Week 7: Control Flow 2 – For Loop

- For Loop basics
- Range function

- Index and steps
- Apply for loop in Python Turtle
- Turtle graphics workshop using for loop

Week 8: Control Flow 3 – While Loop

- While Loop basics
- Compare for loop with while loop
- Apply while loop in Python Turtle
- Turtle graphics workshop using while loop

Week 9: Circles with Python Turtle

- Circle starting point and starting directions
- How to draw various circles
- How to draw oval with circles
- Programming workshop for circle graphics

Week 10: Circle Advanced Topics

- Circle and PI
- How to find point location on a circle
- Using multiple pens to find location
- Using Math Sin/Cos to calculate location
- Programming workshop for circle graphics

Week11: Data Structures 1 – Simple Data Type

- Strings and string manipulation
- Integer and Integer conversion to/from string
- Boolean and Boolean usage
- Turtle graphics workshop

Week 12: Data Structures 2 – Collection Data Type with List

- What is List
- List usage
- Index in List
- Multiple dimensions of List
- Programming workshop using List

Week 13: Data Structures 3 – Collection Data Type with Tuple

- What is Tuple
- Tuple usage
- Compare Tuple with List
- Programming workshop using Tuple

Week 14 Data Structures 4 – Collection Data Type with Set

- What is Set
- Set usage
- Compare Set with List and Tuple
- Programming workshop using Set

Week 15 Data Structures 5 – Collection Data Type with Dictionary

- What is Dictionary
- Dictionary usage
- Compare Dictionary with List, Tuple and Set
- Programming workshop using Dictionary

Week 16 RGB Color and HLS Color

- What is HLS color
- Compare RGB color with HLS color
- Convert RGB color from/to HLS color
- HLS color pros and cons
- Programming workshop using HLS color

Week 17 Animation Basics

- How to draw animation using Python Turtle
- Turtle Trace Function
- Turtle Update function
- Demo of animation graphics
- Programming workshop for animation graphics

Week 18 More Animation Graphics

- Animation graphics using multiple pens.
- Illusions with animations
- Demo of illustration graphics
- Programming workshop for illusion graphics

Week 19 Function Basics

- What is Function
- Function Definition
- Function Invocation
- Function Parameters
- Function return value
- Programming workshop using function

Week 20 Function In depth

- Fixed Function parameters vs Dynamic Function parameters
- Different ways of passing function parameters
- Different ways of invoking a function
- Programming workshop using Function

Week 21 Function Advanced Topics

- Variable scope with function
- Local and global variables usage in function
- Pack and unpack function return value
- Programming workshop using Function

Week 22 Function and Object

- What is Object
- Object Identifier and Memory address
- Compare function with object
- Passing function as object
- Programming workshop using Function

Week 23 Lambda Function

- What is Lambda Function
- Lambda syntax and usage
- Lambda function pros and cons
- Programming workshop using Lambda Function

Week 24 Recursive Function

- What is Recursive Function
- Recursive usage
- Recursive function pros and cons
- Programming workshop using recursive Function

Week 25 Recursive Function for Fractal Graphics

- What is fractal graphics
- How to draw fractal graphics using recursive function
- Programming workshop for fractal graphics

Week 26 More Fractal Graphics

- Demo of drawing fractal trees
- Demo of drawing fractal snowflake
- Fractal Programming workshop 2

Week 27 List Comprehension

- What is List Comprehension
- List comprehension usage
- List comprehension pros and cons
- Programming workshop using List Comprehension

Week 28: Final Projects 1 – Tic-Tac-Toe

- Draw the board for Tic-Tac-Toe
- How to draw the cross and circle on the board
- Programming workshop for Tic-Tac-Toe

Week 29: Final Projects 2 – Tic-Tac-Toe

- How to find out three pieces in a row on the board
- Find winner using 2 dimensional list
- Find winner using bitwise operators
- Programming workshop for Tic-Tac-Toe

Week 30: Final Projects 3 – Tic-Tac-Toe

- Piece all together
- Expand tic-tac-toe to Gobang
- Basic AI algorithms for chess game
- Programming workshop for Tic-Tac-Toe

Week 31: Final Projects 4 – Gobang Game

- Find straight line patterns in Gobang
- Find end points for straight line patterns
- Programming workshop for Gobang

Week 32: Final Projects 5 – Gobang Game

- Find diamond pattern in gobang
- Find center point for diamond pattern
- Programming workshop for Gobang

Week 33: Final Projects 6 – Gobang Game

- AI play defense for Gobang
- AI play offense for Gobang
- Programming workshop for Gobang