

**C Programming for Python Developers**

**Course Number:** PYTH-276  
**Duration:** 3 days

**Overview**

This C Programming for Python Developers training course teaches attendees the C programming language and how to incorporate custom C libraries into their Python programs. Participants learn the essentials of C programming to write programs and code libraries.

**Prerequisites**

Students should be able to write simple Python scripts using basic data types, program structures, and the standard Python library. All students must be software developers with a strong understanding of software development and modern programming languages.

**Materials**

All C/Python training students receive comprehensive courseware.

**Software Needed on Each Student PC**

* A virtual machine (VM) with all tools pre-installed will be provided.
* Students will receive setup instructions for their local machine, but no support will be provided in class to get it working if it has problems.
* Students will need RDP or SSH to access the VM; even those planning to work locally need remote access if their local setup has problems.

**Objectives**

* Learn how to set up a C programming environment
* Explore how to program and run C programs
* Learn code organization through functions and include files
* Understand static typing and dynamic memory allocation
* Practice writing C code called from Python

**Outline**

* Introduction
* The Development Environment
  + Overview of Virtual Machine for Class
  + Visual Studio Code Extensions for C
  + Debugging C with VS Code
* The C Programming Language
  + Development Tools
    - Makefile
    - CMake
    - CPP Check
  + Program Structure
    - Main Function
    - Include Files
    - Header Files
    - Compile to Executable
    - Compile to Shared Library
    - Using Libraries
    - Common Compile Options
  + Data Types
    - Numbers
    - Strings (Arrays of Characters)
    - Arrays
    - Structs
    - Type Defs
    - Type Casting
    - Static Typing vs. Dynamic Typing
    - Loose Typing vs. Strong Typing
    - Static Types
  + Control Flow
    - If
    - Switch
    - While
    - Do-While
    - For
    - Goto
  + Functions
    - Define a Function
    - Call a Function
    - Passing Arguments/Parameters
    - Return Values
    - Function References
    - Pointers
    - Pass By Value vs. Pass By Reference
    - Dynamically Allocating Memory on the Heap
    - Principles and Practices of Dynamic Memory Allocation
    - Linked Lists
    - Untyped Pointers
  + Python and C Integration
    - NumPy Arrays
    - Ctypes FFI
    - Python Struct and Structure
    - Create a Simple C Extension for Python
    - Debug a C Extension for Python
    - Review C Code generated by Cython
  + Basic Profiling of Python programs calling C functions
    - cProfile
    - Time
* Conclusion