

**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