

# COMP-4356 Course Syllabus

## 1 Course Information

Course Name	COMP-4356: Introductory C/C++ Programming
Prerequisites	COMP-4003, COMP-4005
Required Textbook	Programming Principles and Practice Using C++

## 2 Course Description

This course provides an introduction to programming in C, designed for students with some Python programming (COMP-4005 and COMP-4006, ideally). Topics covered include C based:

- Source to binary, compilation, assembling, linking
- Data types and arithmetic operations
- Program input and output
- Logical operators and conditional expressions
- Iterative constructs (loops with conditionals)
- Functions and argument passing
- Nested loops and recursion
- References and pointers (pass by reference)
- Memory allocation - the stack and the heap
- Arrays and lists, C strings
- Structures and basic classes
- File based input/output
- Intro to debugging programs
- Common programming security issues

### 3 Textbook and Materials

The textbook for the course is “Programming Principles and Practice Using C++” by Bjarne Stroustrup - second edition. More information can be found on the author’s website (Links to an external site.). You will need a good internet connection and a laptop that meets DU specifications. (See <https://www.du.edu/it/support/how-to/students/laptops>). For technical support in using Canvas, please go to <http://otl.du.edu/knowledgebase/canvas>

### 4 Course Learning Objectives

Upon successful completion of this course, students will know how to:

1. Take a concrete programming problem statement and translate it into a program to solve the problem.
2. Create a source file from scratch, compile it, and execute it.
3. Identify and implement program constructs to concisely solve the problem (loops, logical operations and arithmetic).
4. Know how to allocate and de-allocate computer memory programmatically, and where that memory is stored.
5. Use correct types for variables and comprehend their different internal (memory) representations.
6. Utilize built-in types for storing data items (e.g., C-style arrays and lists)
7. Build simple data structures (e.g., utilizing structs) for organizing more complex variables.
8. Be able to examine the binary dump of an executable to determine characteristics of how it was linked and to what it was linked.
9. Identify common sources of programming errors leading to vulnerabilities and exploits.
10. Read/write file and console I/O.

### 5 Course Outcomes

Upon successful completion of this course, students will have learned the following high-level objectives:

1. Be able to read and write programs in a low-level programming language (C).
2. Understand memory management and common memory issues in programs.

## 6 Program Level Goals

Courses in the cyber security MS program, including this one, should contribute to overall program level outcomes for students. This course contributes to the following program level goals:

1. Apply programming and core CS topics; including network programming, algorithms and data structures, and computer organization.
2. Utilize and comprehend at least one compiled programming language (C/C++) and two or more interpreted/scripting languages (Bash, Python).

## 7 Knowledge Units

This course covers the following NSA cybersecurity Knowledge Units:

1. Basic Scripting and Programming (BSP, Core Technical CDE)
2. Operating Systems Concepts (OSC, Core Technical CDE)
3. Low-level Programming (LSP, Optional KU)
4. Systems Programming (SPG, Optional KU)

## 8 Attendance Policy

Regular attendance is expected. Students are responsible for all material covered in class, including announcements and handouts.

## 9 Academic Integrity

All work submitted for this course must be the student's own original work. Any instance of plagiarism or cheating will be dealt with according to the university's academic integrity policy. Refer to the Student Rights and Responsibilities, as well as the University of Denver Student Honor code, here: <https://studentaffairs.du.edu/student-rights-responsibilities>

## 10 Disability Services

If you have a disability that may affect your ability to complete the work for this course, please contact the Disability Services office at: <https://studentaffairs.du.edu/disability-services-progr>