

# Portland Community College

## Changes To CS First-Year Sequence

### Summary Of Changes

1. CS 160 includes PCC's "Quantitative Reasoning" institutional outcome.
2. CS 140U (Introduction to UNIX/Linux) no longer required for CS students
3. CS 161 replaced by two new courses:
  - a. CS 161A focuses on computational thinking, program logic and design, and implementing simple data and control structures in C++ using a desktop environment
  - b. CS 161B focuses on user-level Linux skills for CS students, program validation and verification in a Linux environment, and developing C++ programs using the GNU toolchain that implement modular control flows using array and struct based data structures.
4. CS 162 has no changes in description or outcomes, and continues to focus on the implementation of C++ classes and objects, effective use of dynamic variables, and the principles of dynamic linked lists.

### Timeline for Transition

1. Course changes will appear in PCC's 2021-2022 Catalog.
2. CS 160 changes implemented Fall 2021
3. CS 161 will continue to be offered in some form every term through Fall 2021, and then discontinued.
4. CS 161A and CS 161B will be offered in on-campus/remote delivery mode every term starting Fall 2021 (CS161A) and Winter 2022 (both CS161A and 161B).
5. CS 161A and CS 161B will be offered in Online Learning mode every term starting Winter 2021.
6. CS 140U offerings will be reduced to once every now and then starting whenever, in some delivery mode.

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### Detailed Course Outcomes and Contents

#### CS160 Course Outcomes

On completion of this course the student should be able to:

- Create computer programs to implement algorithms that solve problems
- Assess the computational complexity and computability of algorithms and their implementations
- Apply collaborative software development methodologies
- Evaluate career opportunities in computer science and other related disciplines

#### The updated course contents for CS 160

Topic	Description
01 Digital Information	Explore computer hardware basics. Explore how computers store complex information like numbers, text, images and sound as binary data. Talk about the impacts of digitizing information.
02 The Internet	Explore how the Internet works and discuss its impacts on politics, culture, and the economy.
03 Intro to Python Programming	Introduce programming concepts, including variables, input and output, using the Python programming language. Explore algorithm development and parallel computing concepts.
04 Selection	Explore relational operators and Boolean expressions and learn how to alter the flow of

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	a program with selection structures.
05 Iteration	Learn how to use loops to create iteration structures. Logic gates, logical operators, counters, accumulators, and input validation loops are also introduced.
06 Functions	Learn how to define and call functions using top-down design. Learn how to pass arguments to functions and return and handle information.
07 Arrays	Learn how to define and use an array data structure called a list. Perform operations on lists including: inserting and removing objects from a list, iterating over a list, and searching for items in a list.
08 Data	Explore and visualize datasets from a wide variety of topics as you hunt for patterns, make predictions, and try to learn more about the world around you.
09 Artificial Intelligence	Explore and visualize datasets from a wide variety of topics as you hunt for patterns, make predictions, and try to learn more about the world around you.
10 Cybersecurity and Global Impact	Research and debate current events at the intersection of data, public policy, law, ethics, and social impact.

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### CS161A Course Outcomes

Course Number:

CS 161A

Course Title:

Programming and Problem Solving I

Credit Hours:

4

### Course Description 161A

Introduces computer programming through development of programs using a high-level programming language. Explores foundational programming styles, techniques, syntax, and tools in order to develop, write, run, and debug simple computer programs with an emphasis on problem solving. Surveys current social and ethical aspects of computer science.

Recommended: MTH 65 or CS 160.

### Intended Outcomes for the course (CS 161A)

On completion of this course students should be able to:

- Develop simple programming algorithms to solve computing problems.
- Implement the algorithms by writing programs that meet user requirements.
- Construct appropriate user interfaces and develop test plans for correctness of programs.
- Identify and correct syntax errors.
- Apply logical skills to construct efficient and effective algorithms.
- Effectively use software development tools.

### Outcome Assessment Strategies

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Students will complete software projects and proficiency tests which are constructed to demonstrate:

- Written technical communication and effective use of terminology
- Facility with programming language syntax and semantics
- Ability to read and understand specifications, designs and programs
- Application of course concepts including designing of simple algorithms
- Individual capability in design, implementation and testing of small program components

### Course Content (Themes, Concepts, Issues and Skills)

#### C++ Language Topics

##### Algorithms Intro (English)

- What is an algorithm?
- How to design simple algorithms.
- How do computers use algorithms?
- Algorithmic thinking and the connection between programming language and algorithms.

##### Variables / expressions I

- Numeric data types, Strings, characters, Binary, Integer Overflow, Scientific and Floating point notations, arithmetic expressions, operator precedence.

##### Assignment and Input / Output

- Variables and assignment operator, Type conversions, Math functions, Random numbers, Output formatting, simple debugging, increment and decrement operators, simple and compound assignment operator.

##### Conditionals I

- Relational operators, if-else statements, order of evaluation, switch statements, boolean data types, algorithm design.

##### Conditionals II

- string comparison and string access operations, character operations, logical operators, short circuit evaluation, conditional operator and expressions.

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### Loops I

- While loops, do-while loops, for loops, loops and strings.

### Loops II

- Loop algorithms, nested loops, developing programs incrementally, scope of variables.

### Basic Arrays

- Basic Arrays, iterating through arrays and searching through arrays.

### Additional Topics

- compilers, linkers, loaders, pseudocode, mini projects.

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### CS161B Course Outcomes

Course Number:

CS 161B

Course Title:

Programming and Problem Solving II

Credit Hours:

4

### Course Description 161B

Explores intermediate-level problem solving, algorithm and program design, loops, control structures, subprograms, and arrays. Emphasizes development of medium-sized projects using a high-level programming language. Recommended: MTH 95.

### Intended Outcomes for the course (CS 161B)

Upon completion of the course students should be able to:

- Create small computer programs to implement algorithms that solve problems.
- Apply ethical software engineering practices as determined by the Association for Computing Machinery.
- Apply iterative, modular and array constructs.
- Assess algorithmic design, software reusability, and user interfaces
- Effectively use software development tools.

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Course Content (Themes, Concepts, Issues and Skills)

C++ Language Topics

Linux intro (filesystem)

- Login/Logout, password, File Management, directory structure, Pathing, Input/Output, Text file editing and formatting, directories, file transfer basics, email and g++ basic syntax.

Functions (by value)

- function prototypes, header files, math library functions, random numbers, functions with branches and loops, Unit testing.

Functions (by reference)

- reference parameters, default parameters, function overloading, scope of variables, separate files (header files and source files).

Arrays

- Arrays, iterating and looping through arrays, arrays and functions, shifting values (inserting and removing elements), copying, comparing, reversing arrays.

Char arrays / strings

- Char arrays, Cstrings, char and Cstring library functions, Char arrays and functions, multi dimensional arrays.

File Input/Output

- File input, output, read into arrays and 2-dim arrays, menu driven projects.

Structs

- Structs, arrays in structs, nested structs, arrays of structs, structs and functions, simple struct constructors.

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### Pointers

- Basic pointers, pointers to existing simple data types and arrays, memory allocation, address of & and dereferencing operators \*.

### Advanced search and sort

- Searching and sorting algorithms using arrays, arrays of structs.