Foundations of Object-Oriented Programming with Modern C++

Course ID: PA2200

Pextra Academy™

Professional Training in Programming & Software Engineering

Program Overview

This foundational program introduces students to object-oriented programming (OOP) principles using modern C++. Students learn to design, implement, and maintain scalable software systems using professional engineering practices.

Core concepts include encapsulation, inheritance, polymorphism, and abstraction, along with modern C++ features such as dynamic memory management, templates, STL, recursion, and exception handling.

Students gain extensive hands-on experience through labs, assignments, and collaborative development.

Learning Outcomes

- ✔ Design and implement classes using encapsulation, inheritance, and polymorphism
- ✔ Apply operator overloading and advanced function techniques
- ✔ Implement data structures including lists, stacks, queues, and trees
- ✔ Develop and debug recursive algorithms
- ✔ Manage memory safely and identify memory leaks
- ✔ Build reusable and maintainable software components
- ✔ Compare object-oriented and structured design approaches
- ✔ Develop production-ready applications using modern C++

Technology Stack

- GitHub and GitHub Classroom
- Modern C++ compilers (g++, clang++)
- IDEs: Visual Studio Code, CLion, Eclipse
- Standard Template Library (STL)
- Canvas LMS

Curriculum Highlights

Total Instructional Time: 52 Hours

Module	Description	Hours
Introduction & Review	Tools and foundational concepts	4
C++ Fundamentals	Variables, control flow, functions	5
Memory Management	Pointers and dynamic allocation	6
Strings & Pointers	Advanced pointer techniques	5
Core OOP	Classes and encapsulation	6
Advanced OOP	Inheritance and polymorphism	6
Operator Overloading	Special member functions	5
Data Structures	Lists, stacks, trees, recursion	6
Templates	Generic programming and STL	5
Debugging & I/O	Exception handling and file operations	4
Total		**52**

Textbook & Resources

Required/Recommended Textbook:

Foundations of Modern C++: Object-Oriented Design in the Generative AI Era
Ryan Alomari & Raja Alomari, PhD

Available on Amazon:
`https://a.co/d/01EBCojt`

Assessment Model

Component	Weight
Assignments and Labs	25%
Quizzes	15%
Midterm 1	10%
Midterm 2	20%
Final Exam	30%

Prerequisites

Completion of an introductory programming course (CS1 equivalent).

- Understanding of variables, loops, and functions
- Experience with a programming language
- Problem-solving ability

Program Experience

- Weekly lectures and labs
- Hands-on coding assignments
- Collaborative GitHub projects
- Exams and assessments
- Access to modern development tools
- Industry-relevant C++ practices

Instructor Note:

For access to instructional materials, please reach out using the form at http://pextra.academy/contact.