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# Advanced Modern C++ C++11 / C++14 / C++17 / C++20 / C++23

Material based on N4950, created on February 28, 2026

The logo for AKDAB is a blue speech bubble shape. Inside the bubble, the letters 'AKDAB' are written in white. The 'A' is stylized with a white wave-like underline.

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## Ranges and Algorithms

- Type Inference
- Lambdas
- Arrays and Spans
- Range-based for Loop
- Range Views
- Algorithms
- Containers

## Memory Safety and Resource Management

- Null Pointer Literal
- noexcept
- Move Semantics
  - High-level View: Transfer of ownership
  - Low-level View: Rvalue References and `std::move`
- Smart Pointers

## Class Design

- Constructors
- Explicit Virtual Overrides
- Defaulted & Deleted Functions
- Uniform Initialization
- Miscellanea

## Value-Based Techniques in Modern C++

- Pairs and Tuples
- Variants
- Any
- Function Wrappers
- Error Handling with Optional and Expected

## Supplemental Topics

### Multithreading

- Multithreading Introduction
- Multithreading Utilities
- The C++11 Memory Model
- Atomics

### Templates and Generic Programming

- noexcept
- Type Inference
- Wrapping and Invoking Functions
- Perfect Forwarding
- Variadic Templates
- Class Template Argument Deduction
- General Template Changes
- constexpr if
- Expression SFINAE
- Concepts and constraints

## Supplemental Topics

### Additional Language Topics

- Strongly-Typed Enums
- Constant Evaluation
- Deducing this
- Guaranteed Copy Elision
- Structured Bindings
- The Tuple Protocol
- Attributes
- Explicit Conversion Operators
- Alignment Control
- Special User-Defined Types
- Inline Namespaces
- User-Defined Literals
- Stricter Evaluation Order
- Three-way and Default Comparisons

### Additional Standard Library Topics

- Formatting Library
- Allocators
- Random Numbers
- Associative Containers
- Ranges Library
- Regular Expressions
- String Processing
- Filesystem
- General Utilities Libraries
- Time and durations
- Diagnostics Libraries

## Supplemental Topics

### Other Additional Topics

- Introduction to Modern C++
- Compiler Support