### Introduction to Modern C++ Course Outline

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- 1. Introduction and Setup
- 2. C++ Programming Basics
- 3. How C++ Works
- 4. Introduction to OOP
- 5. Advanced OOP
- 6. Templates
- 7. The C++ Standard Library
- 8. Safety in C++
- 9. Compile-Time Programming

# Week 1: Introduction and Setup

1	Cou	rse Introduction	2				
	1.1	Lecture Series Overview	2				
<b>2</b>	Intr	roduction to C++	2				
	2.1	Why C++?	2				
	2.2	Evolution of C++	2				
	2.3		2				
3	Env	ironment Setup	2				
	3.1	Tools Required	2				
			2				
			2				
	3.2		2				
	3.3		2				
4	Basic Syntax and Structure 2						
	4.1	int main()	2				
			2				
5	Dat	atypes and Variables	2				
	5.1	sizeof Operator	2				
	5.2	Primitive Types	2				
	5.3		2				
			2				
			2				
	5.4		2				

# Week 2: C++ Programming Basics

1	I/O	with iostream 2
	1.1	std::cout
	1.2	std::cin
2	Fun	ctions 2
	2.1	Introduction to Functions
		2.1.1 <b>return</b> Keyword
	2.2	Function Overloading
	2.3	Scope
		2.3.1 Defining a Scope
		2.3.2 Types of Scope
3	Con	ditions and Branches 2
	3.1	Boolean Statements
		3.1.1 bool() Casts
		3.1.2 Comparison Operators ==, !=, <, <=, >, >=
		3.1.3 Logical Operators !, &&, —
	3.2	if Statements
	3.3	switch Statements
	3.4	Ternary Operator ( ? : )
4	Loo	ps 2
	4.1	while Loops 2
		4.1.1 do while Loops
	4.2	for Loops
	4.3	Control Flow Statements
		4.3.1 break Keyword
		4.3.2 continue Keyword

# Week 3: How C++ Works

1	$\mathbf{Th}\epsilon$	e Build Process	2
	1.1	The Preprocessor	2
		1.1.1 Text Replacement #define	2
		1.1.2 Conditional Compilation #if, #ifdef	2
		1.1.3 File Inclusion #include	2
	1.2	The Compiler	2
		1.2.1 Compilation Errors	2
	1.3	The Linker	2
		1.3.1 Linker Errors	2
2	Me	mory and Pointers	2
	2.1	Introduction to Memory	2
	2.2	Pointers	2
		2.2.1 NULL Pointers	2
		2.2.2 Pointer Arithmetic	2
		2.2.3 Pointers to Pointers	2
	2.3	References	2
3	Me	mory Segments	2
	3.1	Text Segment	2
	3.2	Static Memory	2
		3.2.1 static Keyword	2
		3.2.2 Initialized vs. Uninitialized Static Data	2
	3.3	Heap Segment	2
		3.3.1 Operators new and delete	2
		3.3.2 Memory Leaks	2
	3.4	Stack Segment	2
		3.4.1 Stack Pointer	2

### Week 4: Introduction to OOP

1	$\mathbf{Arr}$	ays	<b>2</b>					
	1.1	Arrays and Pointers	2					
	1.2		2					
	1.3		2					
	1.4		2					
2	Stru	acts	<b>2</b>					
	2.1	Struct Initialization	2					
3	Classes							
	3.1	Constructors and Destructors	2					
		3.1.1 Initializer Lists	2					
		3.1.2 Default Initialization	2					
		3.1.3 Copy Constructors	2					
	3.2	- *	2					
			2					
			2					
			2					
			2					
	3.3		2					

### Week 5: Advanced OOP

1	Pri	nciples of OOP	2					
	1.1	Abstraction	2					
	1.2	Encapsulation	2					
	1.3	Inheritance	2					
		1.3.1 virtual Functions	2					
		1.3.2 Interfaces	2					
	1.4	Polymorphism	2					
	1.5	Composition	2					
<b>2</b>	Оре	erator Overloading	2					
	$2.\overline{1}$	Type Casting	2					
	2.2	friend Functions	2					
3	Design Patterns 2							
	3.1	Creational Design Patterns	2					
		3.1.1 Singleton	2					
		3.1.2 Factory	2					
	3.2	Behavioral Design Patterns	2					
		3.2.1 Strategy	2					
	3.3		2					
		3.3.1 Adapter	2					

# Week 6: Templates

1	Introduction to Templates	2				
<b>2</b>	Function Templates					
	2.1 Implicit Template Deduction	2				
	2.2 Template Function Overloading	2				
	2.3 Function Template Specialization	4				
3	Class Templates					
	3.1 Class Template Instantiation	-				
	3.2 Class Template Specialization	4				
4	Non-Type Template Parameters					
5	Variadic Templates	5				

# Week 7: The C++ Standard Library

1	Standard Containers	2
2	Iterators	2
3	Ranges and Views	2

# Week 8: Safety in C++

1	Undefined Behavior	2
2	Memory Safety with Smart Pointers	2
3	Exception Safety	2

# Week 9: Compile-Time Programming

1	Lambdas	2
2	Compile-Time Programming	2
3	Template Metaprogramming	2