level 1:- Learninglad.com
level 2:- Complete modern c++ by UMAR LONE
level 3:- Learn Advance Modern C++ by James Raynard

Stage 1: Introduction and Core Concepts

1. **Introduction to the Course** (6min)
2. **Lecturer Introduction** (1min)
3. **Guide to Exercises and Source Code** (1min)

Stage 2: Fundamentals of C++

4. **Local Variables and Function Arguments** (7min)
5. **Reference and Value Semantics** (6min)
6. **Declaration and Initialization** (10min)
7. **Classes** (5min)
8. **Special Member Functions** (6min)
9. **Pointers and Memory** (13min)
10. **Array, String, and Vector** (9min)

Stage 3: Exercises and Practical Applications

Assignment 1: Classes and Strings

11. **Conway's Game of Life Overview** (5min)
12. **Two-Dimensional Arrays** (5min)
13. **Conway's Game of Life Practical** (6min)
14. **Conway's Game of Life Practical Continued** (12min)

Stage 4: Data Types and Type Casting

15. **Numeric Types and Literals** (6min)
16. **String Literals** (6min)
17. **Casting** (8min)

Stage 5: Iterators and Loops

18. Iterator Introduction (7min)
19. The auto keyword (9min)

Quiz 1: Auto Keyword Quiz

20. Loops and Iterators (11min)
21. Iterator Arithmetic and Iterator Ranges (9min)

Quiz 2: Iterator Arithmetic and Iterator Ranges Quiz

Stage 6: Control Structures & Templates

22. If Statements and Switch in C++17 (12min)
23. Templates Overview (14min)
24. Namespaces (12min)

Stage 7: Function Pointers and Strings

25. Function Pointer (6min)
26. Basic String Operations (7min)
27. Searching Strings (5min)
28. Adding Elements to Strings (9min)
29. Removing Elements from Strings (5min)
30. Converting between Strings and Numbers (8min)
31. Miscellaneous String Operations (6min)

Stage 8: File Handling

32. Character Functions (13min)

Assignment 2: Character Functions

33. Files and Streams (5min)
34. File Streams (10min)
35. Streams and Buffering (8min)

36. **Unbuffered Input and Output** (8min)
37. **File Modes** (7min)
38. **Stream Member Functions and State** (13min)
39. **Stream Manipulators and Formatting** (8min)
40. **Floating-point Output Formats** (7min)
41. **Stringstreams** (11min)

Stage 9: Resource Management & Binary Files

42. **Resource Management** (5min)
43. **Random Access to Streams** (7min)
44. **Stream Iterators** (8min)
45. **Binary Files** (11min)
46. **Binary File Practical** (17min)

Stage 10: Constructors and Copying

47. **Constructors in Modern C++** (8min)
48. **Copy Constructor Overview** (6min)
49. **Assignment Operator Overview** (8min)
50. **Synthesized Member Functions** (6min)
51. **Shallow and Deep Copying** (12min)
52. **Copy Elision** (9min)

Stage 11: Operators and Overloading

53. **Conversion Operators** (10min)
54. **Default and Delete Keywords** (6min)
55. **Operators and Overloading** (5min)
56. **Which Operators to Overload** (4min)
57. **The Friend Keyword** (4min)
58. **Member and Non-member Operators** (6min)
59. **Addition Operators** (9min)
60. **Equality and Inequality Operators** (4min)
61. **Less-than Operator** (7min)
62. **Prefix and Postfix Operators** (7min)
63. **Function Call Operator** (7min)
64. **Printing Out Class Member Data** (4min)

Stage 12: Algorithms Overview

65. Algorithms Overview (7min)
66. Algorithms with Predicates (6min)
67. Algorithms with _if Versions (6min)

Stage 13: Lambda Expressions and Functional Programming

68. Lambda Expressions Introduction (5min)

Assignment 5: Algorithm with Lambda Expression

69. Lambda Expressions Practical (4min)
70. Lambda Expressions and Capture (7min)
71. Lambda Expressions and Capture Continued (10min)

Assignment 6: Mutable Lambda

72. Lambda Expressions and Partial Evaluation (7min)
73. Lambda Expressions in C++14 (6min)

Assignment 7: Generalized capture with initialization

74. Pair Type (6min)

Stage 14: STL Algorithms and Operations

75. Insert Iterators (7min)
76. Library Function Objects (3min)
77. Searching Algorithms (6min)
78. Searching Algorithms Continued (5min)
79. Numeric Algorithms (6min)
80. Write-only Algorithms (8min)
81. for_each Algorithm (3min)
82. Copying Algorithms (3min)
83. Write Algorithms (5min)
84. Removing Algorithms (5min)

85. Removing Algorithms Continued (7min)
86. Transform Algorithm (6min)
87. Merging Algorithms (4min)
88. Reordering Algorithms (6min)
89. Partitioning Algorithms (4min)
90. Sorting Algorithms (4min)
91. Sorting Algorithms Continued (6min)
92. Permutation Algorithms (4min)
93. Min and Max Algorithms (3min)
94. Further Numeric Algorithms (5min)
95. Further Numeric Algorithms Continued (7min)

Stage 15: Random Numbers and Simulation

96. Introduction to Random Numbers (4min)
97. Random Numbers in Older C++ (5min)
98. Random Numbers in Modern C++ (7min)
99. Random Number Algorithms (3min)
100. Palindrome Checker Practical (7min)
101. Random Walk Practical (8min)

Assignment 8: Algorithms and Iterators Workshop

Stage 16: Container Types

102. Container Introduction (3min)
103. Standard Library Array (5min)
104. Forward List (5min)
105. List (5min)
106. List Operations (6min)
107. Deque (5min)

Assignment 9: Sequential Containers
Assignment 10: Sequential Containers Part Two

Stage 17: Associative Containers

108. Tree Data Structure (5min)

109. Sets (8min)
110. Map (10min)

Assignment 11: Maps

111. Maps and Insertion (4min)
112. Maps in C++17 (8min)
113. Multiset and Multimap (4min)
114. Searching Multimaps (8min)
115. Unordered Associative Containers (7min)
116. Unordered Associative Containers Continued (4min)
117. Associative Containers and Custom Types (10min)
118. Nested Maps (5min)

Stage 18: Queues, Stacks & Priority Queues

119. Queues (6min)
120. Priority Queues (6min)
121. Stack (5min)
122. Emplacement (7min)

Stage 19: Object-Oriented Principles & Inheritance

123. Mastermind Game Practical (11min)
124. Containers Workshop (1min)
125. Class Hierarchies and Inheritance (3min)
126. Base and Derived Classes (5min)
127. Member Functions and Inheritance (5min)
128. Overloading Member Functions (3min)
129. Pointers, References, and Inheritance (6min)
130. Static and Dynamic Type (4min)
131. Virtual Functions (5min)
132. Virtual Functions in C++11 (5min)

Assignment 12: Virtual Functions

Stage 20: Polymorphism & Error Handling

133. **Virtual Destructor** (6min)
134. **Interfaces and Virtual Functions** (8min)
135. **Virtual Function Implementation** (3min)
136. **Polymorphism** (6min)
137. **Error Handling** (4min)
138. **Error Codes and Exceptions** (7min)
139. **Exceptions Introduction** (6min)
140. **Try and Catch Blocks** (7min)
141. **Catch-all Handlers** (6min)
142. **Exception Mechanism** (6min)
143. **std::exception Hierarchy** (6min)
144. **Standard Exception Subclasses** (5min)
145. **Exceptions and Special Member Functions** (4min)
146. **Custom Exception Class** (6min)
147. **Exception Safety** (3min)
148. **The throw() Exception Specifier** (4min)
149. **The noexcept keyword** (5min)

Stage 21: Move Semantics & Resource Management

150. **Swap Function** (5min)
151. **Exception-safe Class** (4min)
152. **Copy and Swap** (5min)
153. **Comparison with Java and C# Exceptions** (5min)
154. **Move Semantics** (5min)
155. **Lvalues and Rvalues** (6min)
156. **Lvalue and Rvalue References** (8min)
157. **Value Categories** (3min)
158. **Move Operators** (9min

) 159. **Move Constructor** (5min) 160. **Move Assignment** (5min)

Stage 22: Smart Pointers

161. **Smart Pointers** (10min)
162. **std::unique_ptr** (8min)
163. **std::shared_ptr** (11min)
164. **std::weak_ptr** (6min)
165. **std::auto_ptr** (8min)
166. **Memory Management with Smart Pointers** (11min)

167. Custom Deleter for Smart Pointers (9min)
168. std::make_shared and std::make_unique (9min)
169. When to Use Smart Pointers (5min)

Stage 23: Multithreading and Concurrency

170. Multithreading Overview (7min)
171. Thread Creation and Management (9min)
172. std::thread Overview (10min)
173. Thread Synchronization (11min)
174. Mutexes and Locks (8min)
175. Condition Variables (7min)
176. Race Conditions and Deadlocks (9min)
177. Thread-safe Containers (6min)
178. Atomic Operations and Memory Models (8min)
179. Thread Pools (7min)
180. Future and Promise (9min)
181. std::async and std::future (6min)
182. Exception Handling in Threads (6min)
183. Parallel Algorithms in C++17 (7min)
184. C++20 Coroutines for Concurrency (8min)

Stage 24: Advanced C++ Concepts

185. Type Traits and SFINAE (8min)
186. C++ Type Deduction (7min)
187. Template Metaprogramming (9min)
188. Variadic Templates (10min)
189. Tuple and Variadic Functions (8min)
190. C++20 Concepts (8min)
191. Constexpr Functions (7min)
192. Constexpr and Templates (6min)
193. Memory Model and Atomic Types (7min)
194. Compile-time Reflection (C++20) (9min)

Stage 25: C++ Standard Library & STL

195. C++ Standard Library Overview (6min)
196. Container Classes in C++ (9min)
197. std::array vs std::vector (7min)
198. std::list vs std::deque (8min)
199. Set, Map, Multiset, and Multimap (7min)
200. std::unordered_map and std::unordered_set (6min)
201. std::string and std::wstring (7min)
202. std::regex (8min)
203. std::chrono for Date and Time (8min)
204. std::optional (6min)
205. std::variant (7min)
206. std::any (5min)

Stage 26: Modern C++ Features

207. C++11 Features Overview (7min)
208. C++14 Features (7min)
209. C++17 Features (8min)
210. C++20 Features Overview (10min)
211. C++20 Ranges (9min)
212. C++20 Modules (9min)
213. C++20 Concepts (8min)
214. C++20 Calendar and Timezone (6min)
215. C++20 Coroutine Basics (8min)

Stage 27: Performance Optimization in C++

216. Performance Optimization Basics (7min)
217. Cache Locality (8min)
218. Avoiding Unnecessary Copies (6min)
219. Move Semantics and Performance (8min)
220. Compiler Optimizations (7min)
221. Profiling C++ Code (9min)
222. Parallelism and Performance (8min)
223. Memory Pooling (7min)
224. Optimizing Algorithms (7min)

Stage 28: Best Practices and C++ Design Patterns

225. C++ Design Patterns Overview (8min)
226. Factory Pattern (9min)
227. Observer Pattern (7min)
228. Singleton Pattern (7min)
229. Strategy Pattern (8min)
230. RAII (Resource Acquisition Is Initialization) (6min)
231. C++ Best Practices Overview (9min)

Conclusion and Final Thoughts

Course Summary and Review (10min)
Final Project / Assignment Review (10min)