



# **C++ Game Development**



**E-LEARNING COURSE**

**ZETLAN TECHNOLOGIES**

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# COURSE MODULES

## Module 1: Introduction to C++ for Game Development

- Overview of C++ in game development
- Setting up a development environment (Visual Studio, VS Code)
- Understanding game engines (Unreal Engine, SFML, SDL, OpenGL)
- Basics of C++ (variables, data types, operators, control structures)

## Module 2: Object-Oriented Programming in C++

- Classes and objects
- Inheritance and polymorphism
- Encapsulation and abstraction
- Operator overloading
- Smart pointers and memory management

## Module 3: Game Mathematics and Physics

- Coordinate systems and transformations
- Vector and matrix operations
- Collision detection (AABB, circle, and pixel-perfect collisions)
- Physics simulation basics (velocity, acceleration, forces)

## Module 4: Graphics Programming with SDL/SFML/OpenGL

- Rendering images and sprites
- Handling textures and animations
- Basic shaders and lighting techniques
- Using OpenGL for 2D and 3D rendering

## **Module 5: Input Handling & Game Loop**

- Handling keyboard and mouse inputs
- Implementing a real-time game loop
- Frame rate control and delta time
- Event-driven programming

## **Module 6: Audio and Sound Effects**

- Adding background music and sound effects
- Using libraries like SDL\_Mixer or OpenAL
- Adjusting volume and effects dynamically

## **Module 7: Game AI and Pathfinding**

- Finite State Machines (FSM)
- Basic enemy AI behaviors (patrolling, chasing)
- Pathfinding algorithms (A\*, Dijkstra)

## **Module 8: Scripting and Game Logic**

- Integrating Lua or Python for scripting
- Using scripts to control game behaviors dynamically
- Event-driven scripting systems

## **Module 9: Multiplayer and Networking**

- Introduction to networking in games
- Using sockets for multiplayer interactions
- Client-server architecture
- Synchronization and latency handling

## **Module 10: Building a Simple 2D Game**

- Designing game assets and mechanics
- Implementing player controls and interactions
- Adding UI elements (score, health, menus)
- Game state management (pause, resume, restart)

## **Module 11: Introduction to 3D Game Development**

- Basics of 3D rendering with OpenGL
- Introduction to 3D physics engines (Bullet, PhysX)
- Working with 3D models and animations

## **Module 12: Optimizations and Performance Tuning**

- Memory management and profiling
- Multithreading in game development
- Reducing CPU and GPU bottlenecks

## **Module 13: Publishing and Deployment**

- Packaging games for different platforms
- Debugging and testing best practices
- Monetization strategies (ads, in-app purchases, premium mode)

## **Final Project: Develop a Complete Game**

- Planning the game idea
- Implementing gameplay mechanics
- Testing and debugging
- Showcasing the final product