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# Introduction to Modern OpenGL

Based on OpenGL 4.5 / OpenGL ES 3.1, 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 lightning bolt symbol to its left.

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## Core Concepts

- Introduction to Modern OpenGL with Qt
  - What is OpenGL?
  - Terminology
- OpenGL Windows and Contexts
- The (basic) OpenGL pipeline
- Introduction to shader programs
- Vertex Buffer Objects
- Basic drawing calls and primitives
- Making life easier with Vertex Array Objects
- Configurable shader programs
- Module Summary

## Transformations

- Introduction to Transformations
- Basic Transformations
- Combining Transformations
- Coordinate Systems
- View and Projection Transformations
- Module Summary

## Lighting

- Physics of Light
- Diffuse Lighting
- Phong Lighting
- Flat Shading
- Per-fragment Phong Lighting
- Improving the Phong Model
- Directional Lighting
- Multiple Lights
- Simple Toon/Cell Shading
- Spotlights
- Fog
- Module Summary

## Texturing

- Texturing Basics
- Texturing Geometry
- Texture Sampling
- OpenGL Extensions
- Using Multiple Textures
- Specular Maps
- Baked Ambient Occlusion
- Normal Mapping
- Alpha Maps
- Module Summary

## Image-Based Techniques

- Rendering to a Texture
- Reading back
- Post-Processing Effects

## Modern Graphics APIs

- Modern Graphics APIs
  - Introduction
  - Simple Graphics Application
    - Initialize The Rendering Hardware
    - Building a pipeline
    - Render Loop
  - Feeding the pipeline
  - Controlling the pipeline
  - KDGpu Render Loop
  - Resources
    - Memory Buffers
    - Textures
    - Shader Resources
  - Synchronization
  - The Compute Pipeline

## Reading List

- Recommended Books