Due on or before 13th February 2024

# Exercise 1: Evolution of GPUs and Technological Breakthroughs

## Objective:

Explore the evolution of Graphics Processing Units (GPUs) and how technological breakthroughs have contributed to the efficiency of modern GPUs. Highlight the roles of various vendors and their technologies in this evolution.

## Instructions:

### 1. Historical Context:

- Research the early days of GPUs and their role in rendering 2D and basic 3D graphics. Mention the vendors and technologies prevalent during this period.

### 2. Parallel Processing Revolution:

- Investigate how the introduction of programmable shaders in the early 2000s marked a shift towards parallel processing. Explore the contributions of vendors such as NVIDIA and ATI (now part of AMD) during this phase.

### 3. General-Purpose Computing (GPGPU):

- Examine how GPUs expanded beyond graphics to become General-Purpose Computing Units. Discuss the emergence of CUDA by NVIDIA and OpenCL as technologies enabling diverse parallel computing applications.

### 4. Highly Parallel Architectures:

- Explore the advancements in GPU architectures that led to highly parallel designs. Mention technologies such as NVIDIA's CUDA cores, AMD's Stream Processors, and Intel's Xe Architecture.

### 5. Ray Tracing and Real-Time Rendering:

- Investigate how dedicated hardware for ray tracing has transformed modern GPUs, enabling real-time rendering of highly realistic scenes. Identify specific technologies introduced by NVIDIA with RT Cores and AMD's Ray Accelerators.

### 6. Vendor Technologies and Efficiency:

- Discuss how various vendors, including NVIDIA, AMD, and Intel, have introduced technologies to enhance GPU efficiency. Consider features such as NVIDIA's Tensor Cores for AI-based tasks and AMD's Infinity Fabric for high-speed communication between GPU components.

### 7. Additional Considerations:

- Explore any recent breakthroughs or innovations in GPU technology that may not have been covered in the historical context. Consider advancements related to power efficiency, cooling solutions, and integration with emerging technologies.

Submission Guidelines:

- Prepare a detailed report or presentation highlighting key points in each phase of GPU evolution.

- Include visual aids, diagrams, or charts to illustrate technological breakthroughs.

- Identify and reference specific technologies introduced by GPU vendors.

- Discuss the impact of these breakthroughs on the efficiency and capabilities of modern GPUs.

# Exercise 2: Overview of Graphics Libraries

## Objective:

Explore and analyze various graphics libraries used in computer graphics, considering their applications, strengths, and weaknesses.

## Instructions:

### 1. Select Three Graphics Libraries:

- Choose three graphics libraries widely used in computer graphics. Examples include OpenGL, DirectX, Vulkan, WebGL, and Metal.

## 2. Research and Documentation:

- Conduct thorough research on each selected graphics library. Explore official documentation, community forums, and relevant academic sources to gather detailed information.

## 3. Applications:

- Describe the primary applications for each graphics library. Consider the industries or domains where these libraries are commonly employed. Discuss real-world use cases and projects that showcase their applications.

## 4. Strengths:

- Identify and elaborate on the strengths of each graphics library. Consider factors such as performance, cross-platform compatibility, ease of use, and flexibility. Provide examples or case studies that highlight these strengths.

## 5. Weaknesses:

- Analyze the weaknesses or limitations of each graphics library. Explore areas where the library may face challenges, such as specific hardware dependencies, platform restrictions, or performance bottlenecks. Consider any historical issues or criticisms.

## 6. Comparative Analysis:

- Conduct a comparative analysis between the selected graphics libraries. Highlight areas where one library excels over others and vice versa. Consider factors like community support, development tools, and industry adoption.

## 7. Future Trends:

- Explore and discuss any emerging trends or developments related to the selected graphics libraries. Consider ongoing research, new features, or upcoming versions that might impact their future applications.

## 8. Presentation or Report:

- Compile your findings into a well-structured presentation or report. Clearly organize information about each graphics library, ensuring a comprehensive overview with appropriate visuals, charts, or diagrams.

## Submission Guidelines:

- Submit your presentation slides or a comprehensive report with detailed information on each graphics library.