**#OVERVIEW OF CG SYLLABUS:**

1. **Introduction**: This section covers the basics of computer graphics, including the fundamental elements and concepts that are used in computer graphics. You'll learn about the applications of computer graphics and how they are used in various fields, such as entertainment, advertising, engineering, and scientific research.

2. **Graphics Hardware**: This section covers the hardware components that are used in computer graphics. You'll learn about the architecture of Raster and Random scan display devices, which are used to display images on a screen. You'll also learn about input/output devices, such as scanners and printers, which are used to capture and output images.

3. **Drawing Primitives**: This section covers the algorithms used to draw basic shapes and fill polygons. You'll learn about raster scan line algorithms, which are used to draw straight lines on a screen. You'll also learn about circle and ellipse drawing algorithms, which are used to draw curves. Additionally, you'll learn about polygon filling, line clipping, and polygon clipping algorithms, which are used to create complex shapes and cut out parts of an image.

4. **Viewing and Transformations**: This section covers the different geometric transformations used in 2D and 3D graphics, such as translation, rotation, scaling, and shearing. You'll learn about the matrices used to represent these transformations and how they can be applied to objects in a scene. You'll also learn about viewing transformations, which are used to project 3D scenes onto a 2D screen, and vanishing points, which are used to represent perspective in images.

5. **Geometric Modeling**: This section covers the different techniques used to represent curves in computer graphics, such as Hermite curves and Bezier curves. You'll learn about the mathematical equations used to define these curves and how they can be used to create complex shapes.

6**. Visible Surface Determination**: This section covers the algorithms used to determine which surfaces in a scene are visible to the viewer. You'll learn about the Z-buffer algorithm, which is a simple method for determining which surfaces are in front of others. You'll also learn about depth sort algorithms, which are used to sort objects based on their distance from the viewer, and Warnock's algorithm, which is a more complex algorithm for determining visibility.

7. **Surface Rendering**: This section covers the different models and techniques used to render surfaces in computer graphics. You'll learn about color models, which are used to define the colors used in an image. You'll also learn about illumination models, which are used to simulate how light interacts with objects in a scene. Finally, you'll learn about shading models, which are used to simulate how light reflects off different surfaces, and computer animation, which is used to create moving images. By combining these techniques, you can create highly realistic and detailed images and animations.

**#IMPORTANT QUESTIONS:**

1. What are the fundamental elements of computer graphics?

The fundamental elements of computer graphics include geometric primitives (points, lines, curves, polygons), transformations (scaling, rotation, translation), viewing and projection, rendering (shading, lighting, texturing), and animation.

2. What are some applications of computer graphics in different industries?

Computer graphics has numerous applications in different industries, such as entertainment (movies, video games), advertising (graphic design, product visualization), engineering (CAD, architectural visualization), scientific research (data visualization, simulation), and more.

3. How has computer graphics evolved over time?

Computer graphics has evolved significantly over time, starting with simple 2D graphics on early computer displays and progressing to complex 3D graphics with advanced lighting and shading techniques. The development of more powerful hardware and software has enabled increasingly realistic and immersive graphics.

4. What is the difference between raster and random scan display devices?

Raster displays use a grid of pixels to represent images, while random scan displays use a beam of electrons to draw images on the screen. Raster displays are more common and affordable, while random scan displays are more expensive but offer higher resolution and faster refresh rates.

5. What are some examples of input/output devices used in computer graphics?

Examples of input/output devices used in computer graphics include keyboards, mice, tablets, touch screens, scanners, printers, and cameras.

6. How has graphics hardware changed over time?

Graphics hardware has changed significantly over time, with advances in processing power, memory, and graphics cards enabling faster and more realistic graphics. Modern graphics hardware can support high-resolution displays, virtual reality, and real-time ray tracing.

7. What are the different algorithms used to draw lines, circles, and ellipses on a raster display?

Different algorithms are used to draw lines, circles, and ellipses on a raster display, including Bresenham's algorithm and midpoint circle algorithm. These algorithms calculate the pixels that should be lit up to create the desired shape.

8. How are polygons filled and clipped in computer graphics?

Polygon filling involves determining which pixels should be filled in to create a solid polygon. Clipping involves removing portions of polygons that are outside of the viewable area or obscured by other objects in the scene. Examples of polygon filling and clipping algorithms include the scanline algorithm and Sutherland-Hodgman algorithm.

9. What is the difference between line clipping and polygon clipping algorithms?

Line clipping involves determining which portions of a line are inside or outside of the viewable area or obscured by other objects. Polygon clipping involves determining which portions of a polygon are inside or outside of the viewable area or obscured by other objects. Line clipping algorithms include the Cohen-Sutherland algorithm and Liang-Barsky algorithm, while polygon clipping algorithms include the Sutherland-Hodgman algorithm and Weiler-Atherton algorithm.

10. What are the different types of geometric transformations used in computer graphics? Geometric transformations used in computer graphics include scaling, rotation, translation, shearing, and reflection. These transformations are used to manipulate the position, size, and orientation of geometric primitives.

11. How are 2D and 3D viewing transformations used to project scenes onto a 2D screen?

2D and 3D viewing transformations are used to project 3D scenes onto a 2D screen. 2D viewing transformations involve specifying a viewing rectangle and mapping the contents of the scene to that rectangle. 3D viewing transformations involve specifying a camera position, target, and up vector, and mapping the 3D scene onto a 2D projection plane.

12. What are vanishing points and how are they used to represent perspective in images?

Vanishing points are points in a scene where parallel lines appear to converge in the distance. They are used to create the illusion of depth and perspective in images, allowing viewers to perceive the relative positions and sizes of objects in a scene.

13. What are Hermite curves and how are they used to represent curves in computer graphics?

Hermite curves are a type of spline curve used to represent smooth curves in computer graphics. They are defined by a set of control points and tangent vectors that determine the shape and direction of the curve at each point.

14. What are Bezier curves and how are they used to represent curves in computer graphics?

Bezier curves are mathematical representation of curves used in CG. They are defined by a set of control points that define the shape of the curve. Bezier curves are widely used in CG because they are easy to manipulate and can represent a wide range of curves.

15. How do you choose between using Hermite or Bezier curves in a given situation?

The choice between Hermite and Bezier curves depends on the specific requirements of the situation. Hermite curves are better suited for representing curves with sharp corners, while Bezier curves are better suited for representing smooth curves. In general, Bezier curves are more widely used because they are easier to manipulate and can represent a wider range of curves.

16. What is the Z-buffer algorithm and how is it used to determine which surfaces are visible in the scene

The Z-buffer algorithm is a computer graphics algorithm used to determine which surfaces are visible in a scene. It works by assigning a Z-value (depth value) to each pixel in the scene and then comparing these values to determine which surfaces are in front of other surfaces. The Z-buffer algorithm is widely used in computer graphics because it is fast and efficient.

17. What is depth sort algorithm and how is it used to sort objects in a scene based on their distance from the viewer?

The depth sort algorithm is a computer graphics algorithm used to sort objects in a scene based on their distance from the viewer. It works by calculating the distance between each object and the viewer and then sorting the objects based on this distance. The depth sort algorithm is commonly used in computer graphics to improve the rendering of scenes.

18. What is Warnock's algorithm and how is it used to determine visibility in complex scenes?

Warnock's algorithm is a computer graphics algorithm used to determine visibility in complex scenes. It works by recursively dividing the scene into smaller and smaller regions, and then determining the visibility of each region. The algorithm is named after Ivan Sutherland's student, Robert Warnock. It is useful for determining visibility in scenes with complex geometry and occlusion.

19. What is a color model and how is it used to define colors in an image?

A color model is a mathematical representation of color used in computer graphics. It defines how colors are represented as numbers and how those numbers are interpreted by a computer to produce a color. Some common color models include RGB (red, green, blue), CMYK (cyan, magenta, yellow, black), and HSL (hue, saturation, lightness). Color models are used to define the colors in an image and to convert colors between different representations.

20. What is an illumination model and how is it used to simulate how light interacts with objects in a scene?

An illumination model is a mathematical model used in computer graphics to simulate how light interacts with objects in a scene. It takes into account factors such as the direction, intensity, and color of light sources, as well as the surface properties of objects, such as their reflectivity and roughness. Illumination models are used to create realistic lighting effects in computer-generated images.

21. What is a shading model and how is it used to simulate how light reflects off different surfaces in a scene?

A shading model is a mathematical model used in computer graphics to simulate how light reflects off different surfaces in a scene. It takes into account factors such as the direction of the light, the surface orientation, and the surface properties, such as its texture and roughness. Shading models are used to create realistic surface appearances in computer-generated images.