D. Syllabus Detailing and Learning objectives

Module	Chapter	Detailed Content	Syllabus Detailing	Learning Objectives
Module 1	Chapter 1 Introduction to Computergraphics andOutput primitives (hours 10)	Define fundamental parameters required for computer graphics, applications of computer graphics B-Spline curves, Bezier curves, interpolation &fractals,scan conversion of line.	Purpose: To make students understand computer graphics, basic terminologies behind graphics, kind of images used for display, technology used and scan conversion of line & circle, need of curves & fractals Scope – 1. Academic Aspects- Understanding data mining, different pattern to be mined using data mining 2. Technology Aspect- graphics tools & technology used for same. 3. Application Aspect- Application of Computer Graphics in real world & market. Students Evaluation – 1. Theory Questions to be asked on data mining, major data mining issues. 2. Lab experiments can be conducted for case study on data mining 3. Corresponding viva questions can be asked for data mining techniques	1. Definefundamental parameters required for computer graphics like image, object, image representation, pixel etc… (R) 2. Understandneed ofcomputer graphics in real life (U) 3. Distinguish Between various types of Images and display techniques, curves &Draw line using scan conversion algorithms like DDA algorithm & Bresenham's Line drawing algorithm(A) 4. Analyzevarious applications of computer graphics(AN) 5. Evaluateline drawing and circle drawing algorithms thereby comparing their results.(E)
Module 2	Chapter 2 Area Filling and Two Dimensional Transformations (Hours 8)	Area filling: Inside/Outside Test, Scan line Polygon Fill Algorithm, Boundary Fill and Flood Fill algorithm. Basic Geometrical 2D transformations:	Purpose- This chapter is focused on 2D transformation techniques, homogeneous transformation and area filling algorithms Scope – 1. Academic Aspects- Why transformation techniques are required, different techniques to fill polygons. 2. Technology Aspect-tools used for applying	1.Define2D transformations applied on object &Listdifferent types of transformations & area filling techniques .(R) 2. Describe area filling & Inside Outside test (U)

		Translation, Rotation, Scaling, Reflection, Shear, their homogeneous Matrix representation and Composite transformation.	transformations and filling objects with required colors. 3. Application Aspect- Students should understand how transformations can be applied to do any kind of modifications to an object for display purpose. Students Evaluation – 1. Area filling, types of polygon, inside-outside test & polygon filling 2. numerical on translation, scaling, rotation, reflection and shearing transformations 3. Student must explain about Scan line polygon filling process.	3. Apply 2D transformations on object (A) 4 .Distinguish various area Filling techniques & Justify need of homogeneous coordinate system. AN) 5.Compare boundary fill & flood fill algorithm & assess result generated by both techniques.(E)
Module 3	Chapter 3 - Two Dimensional Viewing& Clipping (Hours -8)	Viewing Pipeline , View Coordinate reference frame, Window to viewport transformation, Point clipping, Line clipping: Cohen Sutherland Algorithm, Liang Barskyalgorithms, Polygon clipping: SutherlandHodgeman polygonclipping andWeiler Atherton. Text Clipping.	Purpose – This chapter is focused on Viewing techniques, viewing transformation, Line clipping algorithms like Cohen Sutherland, Liang Barsky & Polygon clipping and text clipping. Scope – 1. Academic Aspects- Student will study the different clipping algorithms & viewing techniques 2. Technology Aspect- Along with algorithms students can learn & practice optional tools used for line & polygon clipping. 3. Application Aspect- Differentclippingalgorithms can be used in animation, Photoshop or any graphics application for betterment of picture or object to display it on display device.	Define window, viewport, clipping (R) 2. Describevarious line , polygon and text clipping techniques (U) 3 .Apply line & polygon, text clipping algorithms to clip the object and make it ready for display purpose. 4ISolve different problems on clipping technique (AN) 5.Justify need of viewing transformation in computer graphics (E)

			Student Evaluation - **1. List the variousclipping techniques** **2. Students can be asked to implement clipping algorithms in laboratory** **3. students should explain the All techniques used for clipping line as well as polygon.**	
Module 4	**Chapter 4 Three Dimensional Transformation, Viewi ng and Projection. (Hours -6)**	**Three Dimensional transformations: Translation, Scaling, Rotations, Composite. Three Dimensional object representation: Polygon Surfaces, Tables, Meshes. Three Dimensional Viewing Pipeline , Viewing transformation , Projections : Parallel(Oblique and orthographic), Perspective (one Point)**	**Purpose –** **This chapter is focused ondifferent 3D transformations, 3D object representations & different types of projections.** **Scope –** **1. Academic Aspects-** **To study 3D transformations like translation, rotation & scaling etc…, Projection & 3D viewing** **2. Technology Aspect-** **Implementing Tools used for 3D transformations & projection techniques.** **3. Application Aspect-** **DifferentTransformation techniques can be used in graphic display, Photoshop or any graphics application.** **Student Evaluation -** **1. List the variousTransformation techniques** **2. Students can be asked to implement 3D transformation on 3D objects.** **3. students should explain the all techniques used for transforming 3D object & applying projection technique as per requirement of graphic application.**	**1.Define3D transformations applied on object &Listdifferent types of transformations &Projection techniques .(R)** **2. Describe3D object representation, polygon surfaces, tables & Meshes.(U)** **3. Apply3D transformations on object (A)** **4 .Distinguish various Projection types& Justify need of 3D transformation system. AN)**

Module 5	**Chapter 5 Introduction to Animation (Hours -2)**	**Key Frame Animation, Animation Sequence, Motion Control Methods, Morphing, Warping.**	**Purpose –** **This chapter focuses on animation & sequence of animation, Image morphing & Warping.** **Scope –** **1. Academic Aspects-** **Animation& process of animation & image processing terms like Image morphing & Warping.** **2. Technology Aspect-** **Developing animated video clip using different animation tools or softwares.** **3. Application Aspect-** **Animation is itself application of computer graphics.** **Student Evaluation –** **1. Explain motion control methods based on geometrical, behavioral, physical & kinematics information& process of animation & morphing & warping techniques.** **2. Students can be asked to Develop animated sequence of any short Scenario** **3. students should explain the Procedural sequence for creating animation.**	**1. Defineanimation & process of animation & image processing terms like Image morphing & Warping(R)** **2. Explain motion control methods based on geometrical, behavioral, physical & kinematics information& process of animation & morphing & warping techniques.(U)** **3. Applyanimation sequence and show movement of any object.(A)** **5. Evaluatedifferent types of animation techniques and compare results.(E)** **6. Developthe short animated video clip using any animation tool.**
	Chapter 6 **Introduction to Virtual Reality (Hours -6)**	**Virtual Reality : Basic Concepts , Classical Components of VR System , Types of VR**	**Purpose –** **This chapter focuses on concepts of virtual reality & various types of virtual reality, three I's of virtual Reality.**	**1. Definebasic concepts of virtual reality & various types of virtual reality like immersive, non-immersive& fully immersive virtual reality.(R)**

		Systems, . Input / Output Devices ,Graphical Rendering Pipeline , Haptic Rendering Pipeline, Open GL rendering pipeline, Applications of Virtual Reality	Scope – 1. Academic Aspects- Explain need of virtual reality & different I/O devices required for Virtual Reality. 2. Technology Aspect- To understand how virtual world is created using VR technology. 3. Application Aspect- Virtual Reality is used in various applications like medical, Education & Training, Military etc.. Student Evaluation – 1. Theory and viva questions for VR, I/o Devices of VR. 2. Need of VR technology 3. Case study on Virtual Reality& its applications.	2. Explain need of virtual reality in real world & different I/O devices required for Virtual Reality like HMD, various types of trackers etc.(U) 3. Recallvarious input output devices required for virtual reality.(U)
Module 6	Chapter 7 Modeling in Virtual Reality(Hours - 4)	Geometric Modeling: Virtual Object Shape, Object Visual Appearance.Kinematics Modeling: Object Position, Transformation Invariants, Object Hierarchies, Physical Modeling:Collision Detection,Surface Deformation, and Force Computation. Behavior Modeling.	Purpose – This chapter focuses on various types of modeling techniques like physical, geometrical, kinematics & behavioral modeling. Scope – 1. Academic Aspects- Collision detection in physical modeling, virtual object, object position & behavioral modeling. 2. Technology Aspect- VR tools can be used and apply on various market application. 3. Application Aspect- Virtual objects &Virtual world creation	1 DefineModeling in VR (R) 2. Describevarious modeling techniques. (U) 3. Explain Modeling techniques in virtual world & Collision detection. (U)

			Student Evaluation – **1. Theory and viva questions for modeling in VR.** **2. Use & types of VR modeling** **3. Develop a case study on different modeling techniques.**	
	Chapter 8 Introduction to VR programming (Hours -4)	**Programming through VRML :** **Defining and Using Nodes and Shapes , VRML Browsers , Java 3D :Visual Object Definition by Shape 3D instances , Defining personal visual object class, ColorCube Class, Geometric –** **Utility Classes, Geometry Classes, Attributes.**	**Purpose –** **This chapter focuses on features of virtual reality programming language.** **Scope –** **1. Academic Aspects-** **Basic components of virtual reality implementation through Java 3D & VRML.** **2. Technology Aspect-** **Developing VR object using implementation of Java3D program or VRML.** **3. Application Aspect-** **Any one short scenario can be designed using VR objects & concepts using either VRML or Java 3D.** **Student Evaluation –** **1. Scene nodes , Java 3D basic concepts** **2. Technology involved in Virtual Reality Modeling language.** **3. Challenges in VR tools & technology.**	**1 Definethe features of virtual reality programming language. (R)** **2. DescribeBasic components of virtual reality implementation through Java 3D, toolkits & scenegraph.(U)** **2. Explain various applications of virtual reality in real world & its advantages.(U)** **3. Explore the implementation of virtual reality using VRML language. (A)**