



Sardar Patel Institute of Technology

Bhavan's Campus, Munshi Nagar, Andheri (West), Mumbai-400058-India
(Autonomous Institute Affiliated to University of Mumbai)

Course Code	Course Name	Teaching Scheme (Hrs/week)			Credits Assigned			
		L	T	P	L	T	P	Total
TEITC501	Computer Graphics And Virtual Reality	4	-	-	4	-	-	4
		Examination Scheme						
		ISE		MSE		ESE		
		10	30	100 (60%Weightage)				

Pre-requisite Course Codes	
After successful completion of the course, student will be able to:	
Course Outcomes	CO1 Identify and demonstrate display primitives: point, line, circle and curves.
	CO2 Demonstrate clip portion that are not of immediate interest.
	CO3 Represent two and three-dimensional objects and projection.
	CO4 Illustrate the fundamentals of animations and virtual reality.
	CO5 Illustrate the various technologies and modeling techniques used in Virtual Reality.

Module No.	Topics	Ref.	Hrs.
1	Introduction to Computer graphics and Output primitives: Introduction, Display Devices, Bitmap and Vector based graphics, Overview of Coordinate system, Scan Conversion of: point, line using Digital differential analyzer & Bresenham's algorithm, circle using midpoint approach, Curve Generation : Bezier and B-Spline curves. Introduction to fractals: generation procedure, classification, dimension and Koch Curve	1,2	10
2	Area Filling and Two Dimensional Transformations: Area filling: Inside/Outside Test , Scan line Polygon Fill Algorithm , Boundary Fill and Flood Fill algorithm. Basic Geometrical 2D transformations: Translation, Rotation, Scaling, Reflection, Shear, their homogeneous Matrix representation and Composite transformation.	1,2	8
3	Two Dimensional Viewing: Introduction ,Viewing Pipeline , View Coordinate reference frame , Window to viewport transformation, Point clipping, Line Clipping: Cohen Sutherland Algorithm, Liang Barsky algorithms, Polygon clipping: Sutherland Hodgeman polygon clipping and Weiler Atherton. Text Clipping.	1,2	6



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4	Three Dimensional Transformation, Viewing and Projection: 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)	1,2	6
5	Introduction to Animation Key Frame Animation, Animation Sequence, Motion Control Methods, Morphing, Warping(only Mesh Warping).	2	2
6	Introduction to Virtual Reality Virtual Reality : Basic Concepts , Classical Components of VR System , Types of VR Systems, Three Dimensional Position Trackers, Navigation and Manipulation Interfaces, Gesture, Interfaces, Graphical Display, Sound displays, and Haptic Feedback . Input Devices ,Graphical Rendering Pipelin , Haptic Rendering Pipeline, Open GL rendering pipeline.Applications of Virtual Reality.	2	8
7	Modeling Geometric Modeling: Virtual Object Shape, Object Visual Appearance. Kinematics Modeling: Object Position, Transformation Invariants, Object Hierarchies, Physical Modeling: Collision Detection, Surface Deformation, Force Computation. Behavior Modeling.	2	4
8	Introduction to VR programming Introduction , 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.	2	4
Total hours of instructions			48

References:

1. Donald Hearn and M. Pauline Baker, “*Computer Graphics*”, Pearson Education.
2. R. K Maurya, “*Computer Graphics with Virtual Reality*”, Wiley India.