Shri Vile Parle Kelavani Mandal's

Dwarkadas J. Sanghvi College of Engineering

(Autonomous College Affiliated to the University of Mumbai)

Scheme and detailed syllabus of DJ19 Honors Program in Immersive Technologies

Revision: 1 (2019)

With effect from the Academic Year: 2023-2024

Proposed scheme for Honors in Immersive Technologies

(Academic Year 2023-2024)

Sr.	Course Code	Course	Teaching Scheme (hrs.)				Continuous Assessment (A) (marks)			Semester End Assessment (B) (marks)					(A+B)	Total Credits
			Th	P	T	Credits	Th	T/W	Total CA (A)	Th / Cb	O	P	O & P	Total SEA (B)		
		Sem V														
1	DJ19AMLHN1C1	Computer Graphics	4	--	--	4	25	--	25	75	--	--	--	75	100	4
		Sem VI														
2	DJ19AMLHN1C2	Augmented Reality and Virtual Reality	4	--	--	4	25	--	25	75	--	--	--	75	100	4
	DJ19AMLHN1L1	Augmented Reality and Virtual Reality Laboratory	--	2	--	1	--	25	25	--	25	--	--	25	50	1
		Sem VII														
3	DJ19AMLHN1C3	Game Design and Gamification	4	--	--	4	25	--	25	75	--	--	--	75	100	4
4	DJ19AMLHN1L2	Game Design and Gamification Laboratory	--	2	--	1	--	25	25	--	25	--	--	25	50	1
		Sem VIII														
5	DJ19AMLHN1C4	Metaverse	4	--	--	4	25	--	25	75	--	--	--	75	100	4
		Total	**16**	**4**	**0**	**18**	**100**	**50**	**150**	**300**	**50**	**0**	**0**	**350**	**500**	**18**

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NAAC Accredited with "A" Grade (CGPA : 3.18)

Program: Artificial Intelligence and Machine Learning	Semester : V
Course: Computer Graphics	Course Code: DJ19AMLHN1C1

Prerequisite: Basic Mathematics, C Programming, Java

Course Objectives: The course intends to introduce the students to fundamental knowledge and basic technical competence in the field of computer graphics. The course will introduce the basic concepts of Computer graphics. The course will also acquaint the student with algorithms for generating and rendering graphical models, mathematics for geometrical transformations. The course will also enable students to apply various techniques of projections, shading, illumination and lighting to graphical models.

Course outcomes: On successful completion of this course, learner will be able to:

1. Implement various algorithms to generate lines, circles, curves, fractals, polygons and color them.
2. Apply 2D and 3D Transformations, viewing and projections on a given object.
3. Understand the concept of color models, lighting, shading and hidden surface elimination.
4. Design an animation sequence.

Detailed Syllabus: (unit wise)

Unit	Description	Duration
1	**Introduction to Computer graphics and Output Primitives:** Graphics primitives- pixel, resolution, aspect ratio, frame buffer, refresh rates, Display Devices, Bitmap and Vector based graphics, Overview of Coordinate system. Scan Conversion of - point, line using Digital differential analyser & Bresenham's algorithm, circle using midpoint approach and Bresenham. **Polygons:** Concave, Convex, Inside/Outside Test **Area Filling:** Scan line Polygon Fill Algorithm, Boundary Fill and Flood Fill algorithm	08
2	**Two Dimensional Transformations:** Basic Geometrical 2D transformations- Translation, Rotation, Scaling, Reflection, Shear, their homogeneous Matrix representation, and Composite transformation. **Three Dimensional Transformations:** Translation, Rotation, Scaling, Rotation about an arbitrary axis	07
3	**Viewing Transformations and Projections:** 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. Three Dimensional Viewing Pipeline, Viewing Transformation, Projections: Parallel(Oblique and Orthographic), Perspective (one Point, two point and three point)	07
4	**Light, Color, Shading and Hidden Surfaces:** Properties of Light, Color Models - CIE chromaticity diagram, RGB, HSV, CMY	07

	Illumination Models: Ambient Light, Diffuse reflection, specular reflection, Phong Model, combined diffuse and specular reflections with multiple light sources, Warn Model **Shading Algorithms:** Halftone, Gouraud and Phong Shading **Hidden Surfaces:** Introduction, Back face detection and removal, Algorithms: z buffer, Painter's algorithm, Area Subdivision (Warnock)	
5	**Curves:** Introduction to curves, interpolation and approximation, Blending Function, Bezier and B-spline curves **Fractals:** Introduction, Classification, Fractal Generation- Snowflake, Sierpinski Gasket, Koch Curve, Cantor Middle-Thirds Set, Hilbert Curve, Applications of Fractals.	06
6	**Introduction to Animation:** Key Frame Animation, Animation Sequence, Motion Control Methods, Morphing, Warping (only Mesh Warping).	04

Books Recommended:

Text books:

1. Donald Hearn and M. Pauline Baker, "Computer Graphics C Version", 2nd Edition, Pearson Education, 2002.
2. John F Hughes, Andries Van Dam, Morgan McGuire, David F Sklar, James D Foley, Steven K Feiner, Kurt Akeley, "Computer Graphics Principles and Practice", 3rd Edition, Pearson Publication, 2018.
3. Rajesh K. Maurya, "Computer Graphics", 1st Edition, Wiley India Publication, 2011.
4. Zhigang Xiang, Roy A. Plastock, "Computer Graphics", 2nd Edition, Schaum's Outlines, McGraw Hill, 2020.

Reference Books:

1. Donald Hearn and M. Pauline Baker, "Computer Graphics with Open GL", 4th Edition, Pearson Education, 2013.
2. Steven Harrington, "Computer Graphics A Programming Approach", 2nd Edition, McGraw Hill, 2018.
3. David F. Rogers, "Procedural Elements of Computer Graphics", 2nd Edition, Tata McGraw Hill, 2017.
4. F.S. Hill, Stephen M. Kelley, "Computer Graphics using Open GL", 3rd Edition, Prentice Hall, 2007.
5. Samit Bhattacharya, "Computer Graphics", Oxford Publication, 2018.

Prepared by | Checked by | Head of the Department | Principal