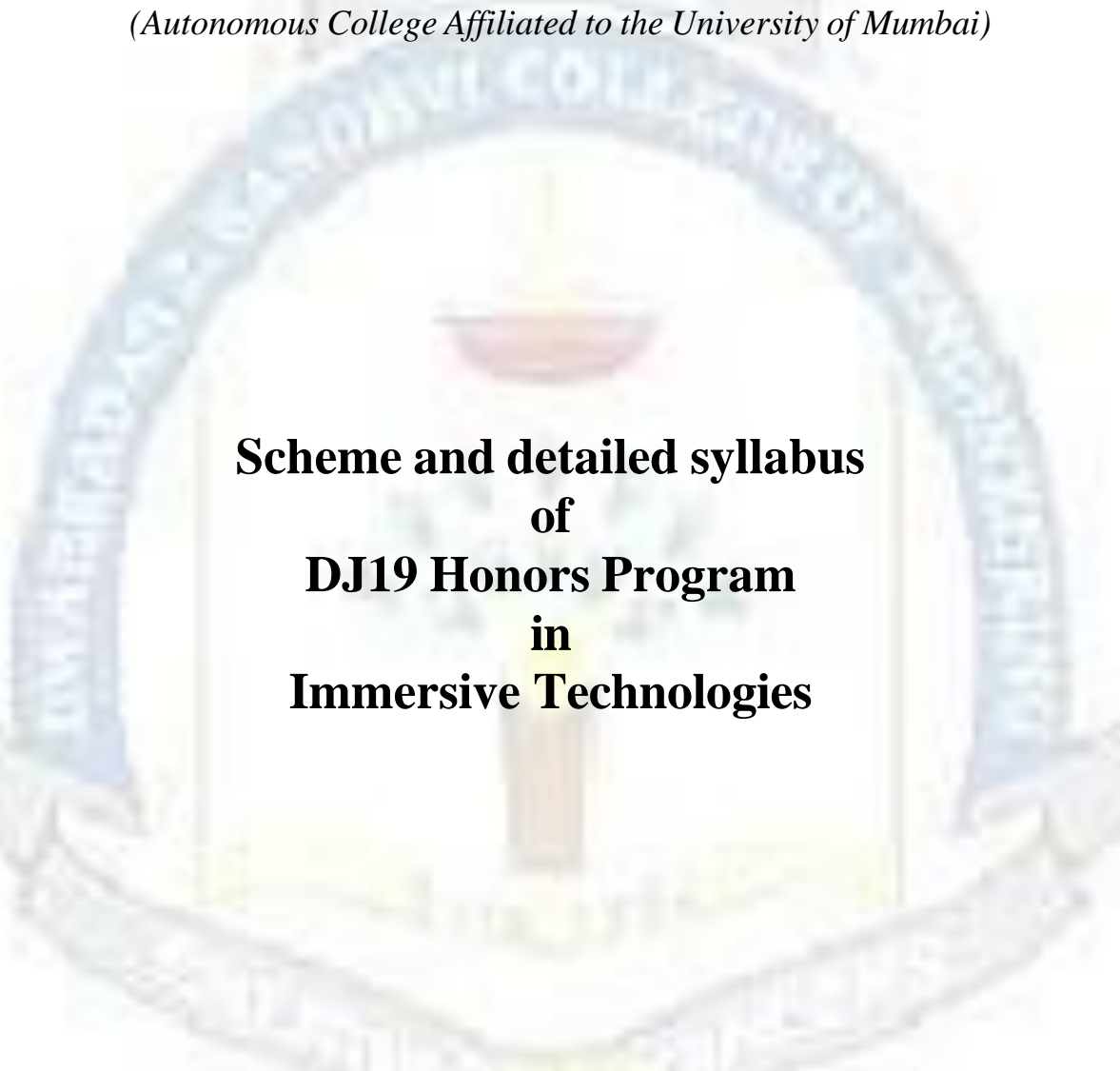




Shri Vile Parle Kelavani Mandal's

# 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 (2023)*

*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)		
<b>Sem V</b>																
1	DJ19AMLHN1C1	<b>Computer Graphics</b>	4	--	--	4	25	--	25	75	--	--	--	75	100	4
<b>Sem VI</b>																
2	DJ19AMLHN1C2	<b>Augmented Reality and Virtual Reality</b>	4	--	--	4	25	--	25	75	--	--	--	75	100	4
	DJ19AMLHN1L1	<b>Augmented Reality and Virtual Reality Laboratory</b>	--	2	--	1	--	25	25	--	25	--	--	25	50	1
<b>Sem VII</b>																
3	DJ19AMLHN1C3	<b>Game Design and Gamification</b>	4	--	--	4	25	--	25	75	--	--	--	75	100	4
4	DJ19AMLHN1L2	<b>Game Design and Gamification Laboratory</b>	--	2	--	1	--	25	25	--	25	--	--	25	50	1
<b>Sem VIII</b>																
5	DJ19AMLHN1C4	<b>Metaverse</b>	4	--	--	4	25	--	25	75	--	--	--	75	100	4
<b>Total</b>			<b>16</b>	<b>4</b>	<b>0</b>	<b>18</b>	<b>100</b>	<b>50</b>	<b>150</b>	<b>300</b>	<b>50</b>	<b>0</b>	<b>0</b>	<b>350</b>	<b>500</b>	<b>18</b>



**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	<p><b>Introduction to Computer graphics and Output Primitives:</b> Graphics primitives- pixel, resolution, aspect ratio, frame buffer, refresh rates, Display Devices, Bitmap and Vector based graphics, Overview of Coordinate system.</p> <p>Scan Conversion of - point, line using Digital differential analyser &amp; Bresenham's algorithm, circle using midpoint approach and Bresenham.</p> <p><b>Polygons:</b> Concave, Convex, Inside/Outside Test</p> <p><b>Area Filling:</b> Scan line Polygon Fill Algorithm, Boundary Fill and Flood Fill algorithm</p>	11
2	<p><b>Two Dimensional Transformations:</b> Basic Geometrical 2D transformations- Translation, Rotation, Scaling, Reflection, Shear, their homogeneous Matrix representation, and Composite transformation.</p> <p><b>Three Dimensional Transformations:</b> Translation, Rotation, Scaling, Rotation about an arbitrary axis</p>	10
3	<p><b>Viewing Transformations and Projections:</b> 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.</p> <p>Three Dimensional Viewing Pipeline, Viewing Transformation, Projections: Parallel (Oblique and Orthographic), Perspective (one Point, two point and three point)</p>	10

4	<b>Light, Color, Shading and Hidden Surfaces:</b> Properties of Light, Color Models - CIE chromaticity diagram, RGB, HSV, CMY <b>Illumination Models:</b> Ambient Light, Diffuse reflection, specular reflection, Phong Model, combined diffuse and specular reflections with multiple light sources, Warn Model <b>Shading Algorithms:</b> Introduction to Rendering, Halftone, Gouraud and Phong Shading <b>Hidden Surfaces:</b> Introduction, Back face detection and removal, Algorithms: z buffer, Painter's algorithm, Area Subdivision (Warnock)	08
5	<b>Curves:</b> Introduction to curves, interpolation and approximation, Blending Function, Bezier and B-spline curves <b>Fractals:</b> Introduction, Classification, Fractal Generation- Snowflake, Sierpinski Gasket, Koch Curve, Cantor Middle-Thirds Set, Hilbert Curve, Applications of Fractals.	08
6	<b>Introduction to Animation:</b> Key Frame Animation, Animation Sequence, Motion Control Methods, Morphing, Warping (only Mesh Warping).	05
	<b>TOTAL</b>	<b>52</b>

### Books Recommended:

#### Text books:

1. Donald Hearn and M. Pauline Baker, "Computer Graphics C Version", 2<sup>nd</sup> Edition, Pearson Education
2. James D. Foley, Andries van Dam, Steven K Feiner, John F. Hughes, "Computer Graphics Principles and Practice in C", 2<sup>nd</sup> Edition, Pearson Publication
3. Rajesh K. Maurya, "Computer Graphics", Wiley India Publication.

#### Reference Books:

1. Donald Hearn and M. Pauline Baker, "Computer Graphics with Open GL", 4<sup>th</sup> Edition, Pearson Education
2. Steven Harrington, "Computer Graphics", McGraw Hill.
3. Rogers, "Procedural Elements of Computer Graphics", Tata McGraw Hill.
4. F.S. Hill, Stephen M. Kelley, "Computer Graphics using Open GL" Prentice Hall
5. Samit Bhattacharya, "Computer Graphics", Oxford Publication

Prepared by

Checked by

Head of the Department

Principal



**Continuous Assessment (A):**

Course	Assessment Tools	Marks	Time (hrs.)
Theory	One Term test (based on 40 % syllabus)	25 each (Avg.25)	1
	Second Term test (next 40 % syllabus ) / presentation / assignment / course project / group discussion / any other.		as applicable
Audit course	Performance in the assignments / quiz / power point presentation / poster presentation / group project / any other tool.	--	
Laboratory	Performance in the laboratory and documentation.	25	
Tutorial	Performance in each tutorial & / assignment.	25	
Laboratory & Tutorial	Performance in the laboratory and tutorial.	25	

The final certification and acceptance of term work will be subject to satisfactory performance upon fulfilling minimum passing criteria in the term work / completion of audit course.

**Semester End Assessment (B):**

Course	Assessment Tools	Marks	Time (hrs.)
Theory / * Computer based	Written paper based on the entire syllabus.	75	3
	* Computer based assessment in the college premises.		
Oral	Questions based on the entire syllabus.	25	as applicable
Practical	Performance of the practical assigned during the examination and the output / results obtained.	25	2
Oral & Practical	Project based courses - Performance of the practical assigned during the examination and the output / results obtained. Based on the practical performed during the examination and on the entire syllabus.	as per the scheme	2