

### **SBC (3) (III.5.2) Mathematics in Visual Art and Design Skill Based Course**

#### **1. Credit Distribution of the Course**

Course title & Code	Credits	Credit distribution of the course			Eligibility criteria	Pre-requisite of the course (if any)
		Lecture	Tutorial	Practical/ Practice		
<b>SBC (3) (III.5.2)</b>						
<b>Mathematics in Visual Art and Design</b>	<b>2</b>	<b>0</b>	<b>0</b>	<b>2</b>	<b>Undergraduate</b>	<b>NIL</b>

#### **2. Learning Objectives**

The course aims to develop an understanding of the mathematical foundations underlying visual patterns, symmetry, and perspective, while fostering an appreciation of how geometry appears in art, architecture, and natural forms. It enables learners to explore mathematical ideas through visual, creative, and digital activities, and introduces them to the geometric principles of linear perspective and projection used in visual representation. Overall, the course cultivates the ability to analyze and construct visual compositions using mathematical concepts.

#### **3. Learning Outcomes**

- Explain the geometrical concepts of symmetry, symmetry groups, and linear perspective, and apply these ideas to analyse visual and spatial forms.
- Identify and classify different types of symmetry—reflectional, rotational, translational, and glide reflection—in natural patterns, architectural elements, and artworks.
- Design and create wallpaper patterns and tessellations using both manual and digital techniques with tools such as GeoGebra and EscherSketch.
- Analyse traditional and cultural art forms (e.g., rangoli, jaali patterns, temple carvings) from a mathematical perspective to reveal principles of proportion and symmetry.
- Apply one-, two-, and three-point perspective techniques to construct accurate spatial representations in drawings.
- Determine vanishing points and viewing positions in artworks and photographs.
- Engage in project-based inquiry and photographic explorations to reflect critically on the relationship between mathematics, art, and culture.

#### 4. Syllabus

The classroom and laboratory activities will be based on the following topics.

**Symmetry:** Geometrical definition of symmetry; Symmetry around us; Symmetry of finite plane figures; Symmetry of wall paper patterns; Symmetry groups; Symmetry in monuments and ornamental art.

**Linear Perspective:** Mathematical principles of linear perspective and projection; One, two and three point linear perspective; Vanishing points; Duplicating simple geometric figures (circle and polygons) in one and two point perspective; Finding the viewing point of a painting in one point perspective.

#### 5. Practicals

[60 hours]

- Observe and sketch symmetrical patterns found in nature and architecture.
- Group discussion on examples of geometry in design and monuments.
- Explore reflectional, rotational, and translational symmetry using mirrors and tracing paper.
- Classify real-world objects and patterns according to symmetry type.
- Capture photographs of symmetrical patterns around the campus or neighborhood.
- Create a digital collage showing various symmetry types.
- Design wallpaper patterns manually on grid paper.
- Recreate the same using GeoGebra or EscherSketch to identify symmetry groups.
- Create tessellations using geometric shapes.
- Modify tessellations into living forms (birds, fish, reptiles) inspired by Escher.
- Study and reproduce rangoli, kolam, and jaali patterns.
- Overlay geometric shapes on these designs to analyze symmetry and proportion.
- Demonstrate horizon lines, vanishing points, and eye levels using simple sketches.
- View and discuss famous artworks demonstrating perspective (e.g., Renaissance art).
- Draw interior or corridor scenes using one-point perspective.
- Practice finding the viewing point in sample paintings.
- Draw cubes, boxes, and buildings using two vanishing points.
- Construct tall structures and aerial views using three-point perspective.
- Analyze perspective geometry in selected artworks or photographs.
- Identify horizon line and vanishing points digitally using phone cameras or GeoGebra
- Take photographs of architectural spaces (corridors, streets, bridges). Overlay vanishing lines digitally to locate the perspective geometry.

#### 6. Essential Readings

- Frantz, M. & Crannel, A. (2011). *Viewpoints: Mathematics Perspective and Fractal Geometry in Art*. Princeton University Press.
- Pedoe, D. (2011). *Geometry and Visual Art*. Dover Publication, New York.
- Bagai, S., Habib, A. & Venkataraman, G. (2024). *Mathematics by Social Scientists*. Taylor and Francis.

### **7. Suggestive Readings**

- Anderson, L. (2022). *Linear Perspective and Model drawing*. Legare Street Press.
- Weyl, H. (2016). *Symmetry*, Princeton University Press.
- Farris, F.A. (2015). *Creating Symmetry: The Artful Mathematics of Wallpaper Pattern*. Princeton University Press.