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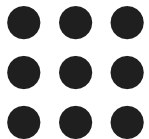
Department of Information Technology & Artificial Intelligence & Data Science

Course Name - COMPUTER GRAPHICS

III Year / V Semester

Unit 4 - SURFACE DESIGN

Topic:Color Theory



COLOR THEORY

- Colour theory in design is the collection of rules and guidelines which designers use to communicate with users through appealing colour schemes in visual interfaces.
- To pick the best colors every time, designers use a colour wheel and refer to extensive collected knowledge about human optical ability, psychology, culture and more.
- Colour theory dictates how colours can be combined for optimal use.
- There are three basic categories of colour theory that are logical and useful : The colour wheel, colour schemes, and the colour psychology





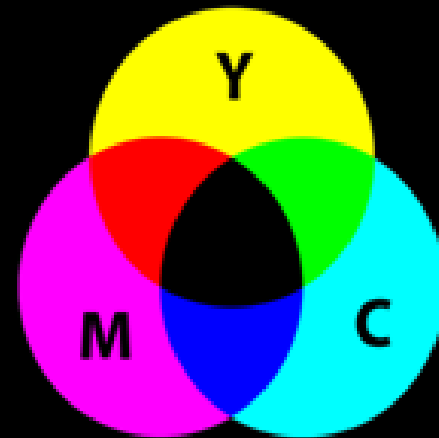
Colour Theories

1. Subtractive Theory

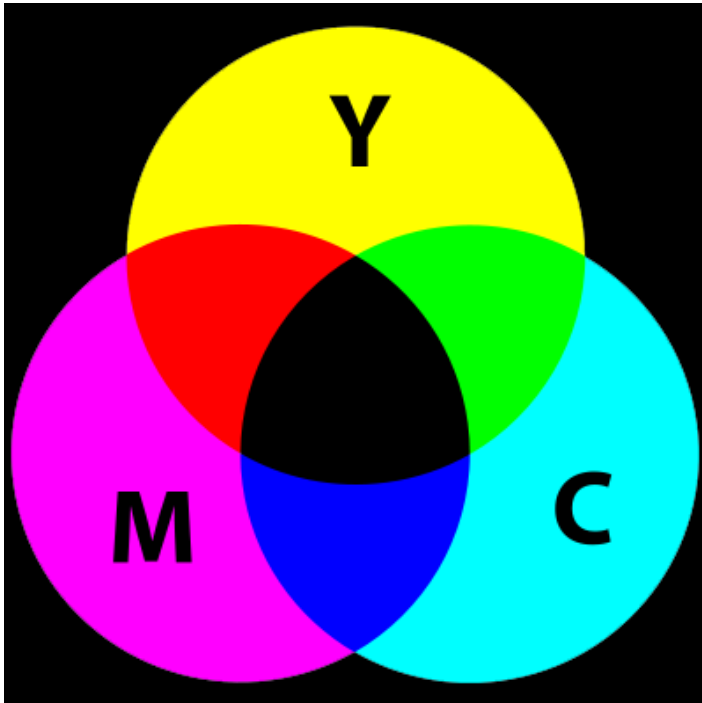
- The **subtractive**, or **pigment** theory deals with how white light is absorbed and reflected off of coloured surfaces.

2. Additive Theory

- The **Additive**, or **light** theory deals with radiated and filtered light.

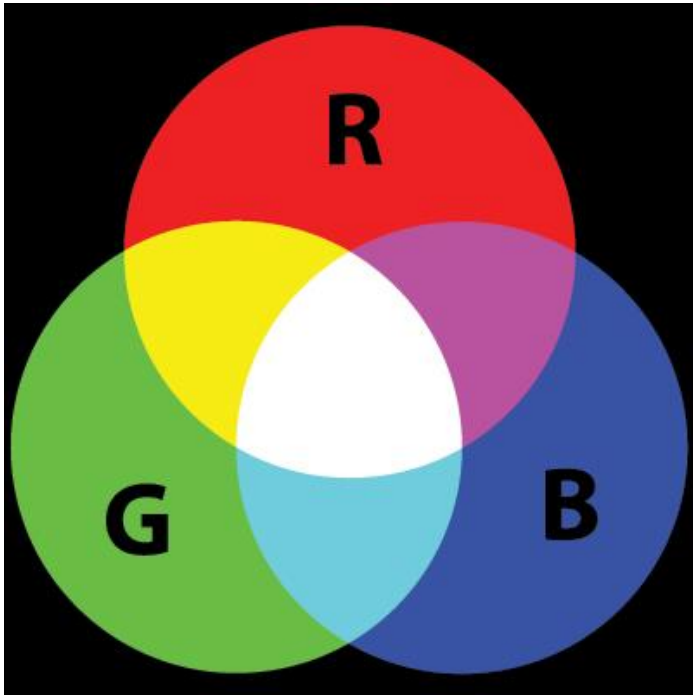


Subtractive Theory



- Black absorbs most light
- White reflects most light
- Coloured Pigments absorb light and reflect only the frequency of the pigment colour.
- All colours other than the pigment colours are absorbed so this is called subtractive colour theory.
- The primary colours in Subtractive Theory are:
 - Cyan (C)
 - Magenta (M)
 - Yellow (Y)
 - Black (K)
- Subtractive or Pigment Theory is used in printing and painting.

Additive Theory

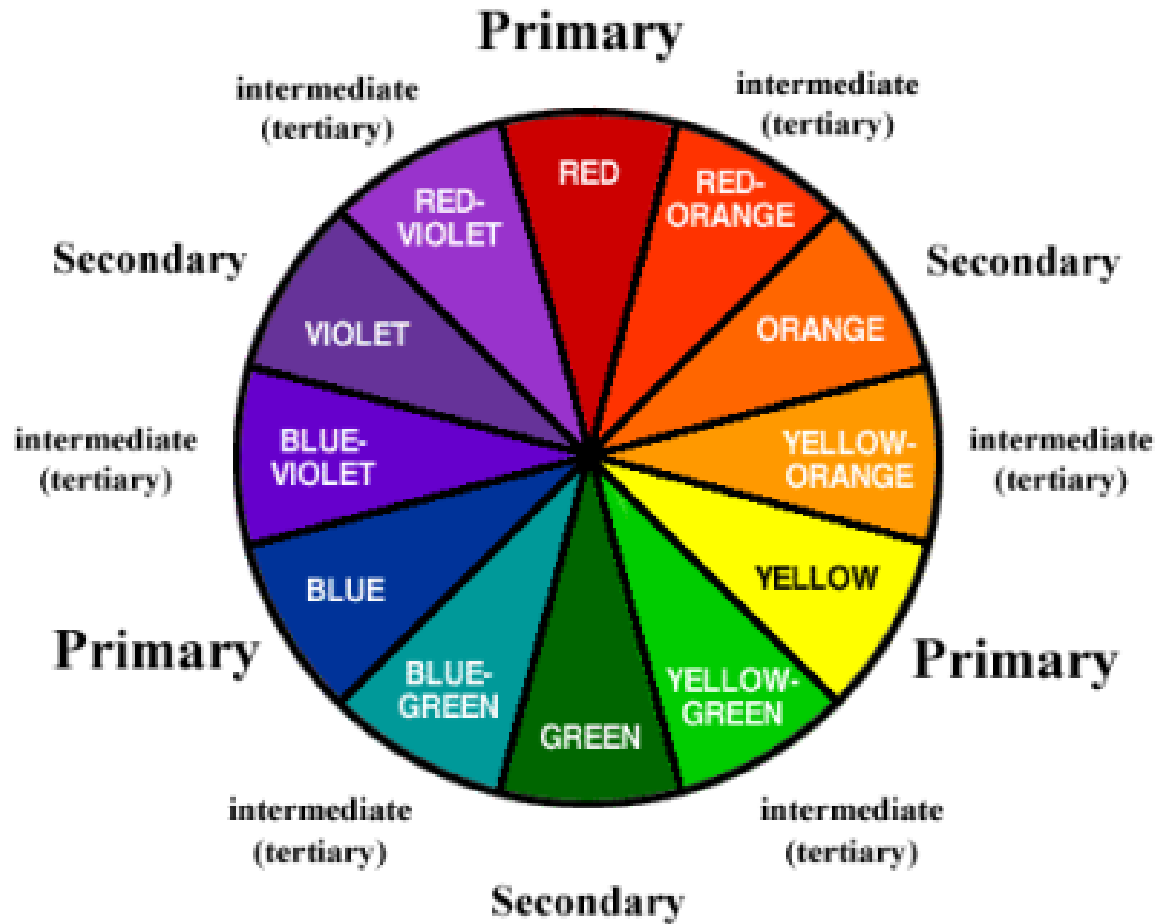


- Black radiates no light
- White (sun) radiates all light
- Video is the process of capturing and radiating light, therefore it uses Additive (Light) Theory not Subtractive (Pigment) Theory.
- The primary colours in Additive Theory are:
 - Red (R)
 - Green (G)
 - Blue (B)
- The primary colours add together to make white
- Light Theory is also called Additive Theory.
- Light Theory is used in Television, theater lighting, computer monitors, and video production.

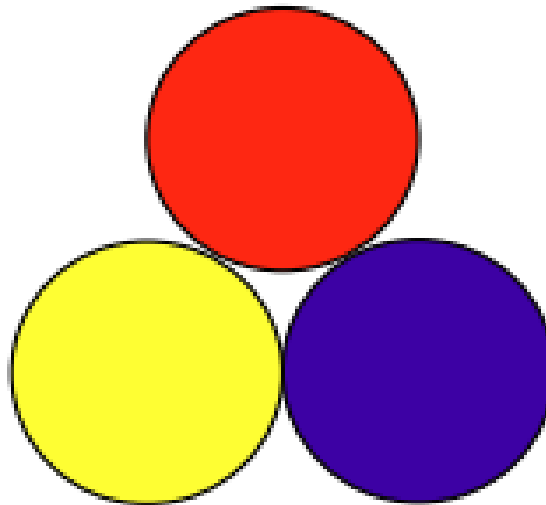
COLOUR WHEEL

- In 1876, Louis Prang stated an advanced colour wheel theory and developed a colour wheel which is commonly known as the Artist's or Prang colour wheel.
- The colour wheel consists of 12 colours in total which are classified into three categories- primary, secondary and tertiary colours.

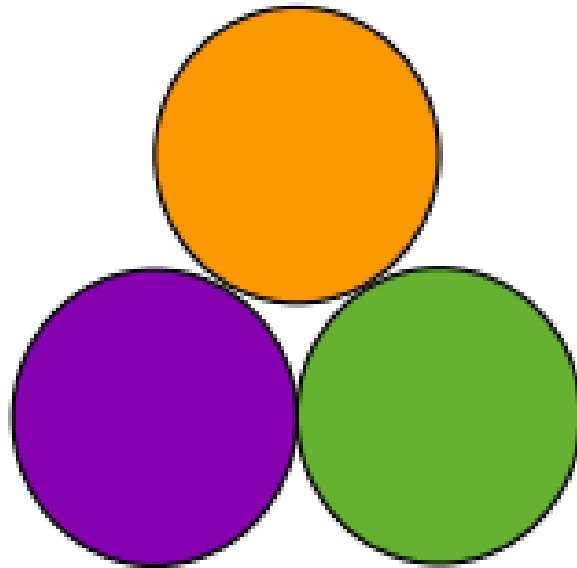
three categories- primary, secondary and tertiary colours.



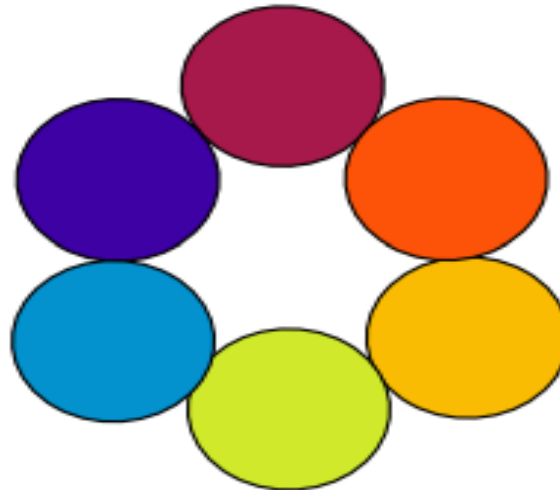
- Primary colours- these colours cannot be formed by mixing any of the colours and are naturally available in the environment.
- The three primary colours are – Red, Yellow and Blue.



- Secondary colours- these colours are formed by mixing two primary colours in equal proportion.
- The three secondary colours are- Orange, Green and Violet.



- Tertiary colours:- these colours are formed by mixing one primary colour and one secondary colour in equal proportion.
- The six tertiary colours are- Red-orange, Yellow-orange, Yellow-green, Blue-green, Blueviolet and Red-violet.



Generally, black and white are not considered as colours. They are considered as the absence and presence of light. Black is the complete absence of light while white is the complete presence of light.



Formation of colours on colour wheel

Secondary colours:

Red + Yellow=Orange

Yellow + Blue=Green

Blue + Red=Violet

Tertiary colours:

Red + Orange=Red-orange

Yellow + Orange=Yellow-orange

Yellow + Green=Yellow-green

Blue +Green=Blue-green

Blue + Violet=Blue-violet

Red + Violet=Red-violet

Colour schemes

Working with colour wheel as a guide there are several types of colour harmonies or schemes that can be created as follows:

- 1) **Complementary colour scheme-** these are any two colours which are situated directly opposite to each other on a colour wheel. This colour scheme creates maximum contrast and maximum interest. For eg- Red and Green, Blue and Orange, Yellow and violet.
- 2) **Split-complementary colour scheme-** This colour scheme is created by choosing any primary or secondary colour on the colour wheel and then finding out the split of its complement colour. For eg- the split complement colour of green would be Red-violet and Red-orange.
- 3) **Analogous colour scheme-** This colour scheme includes the colours that are situated adjacent to each other on a colour wheel in a clockwise direction. For eg- Red, Red-orange and Orange.

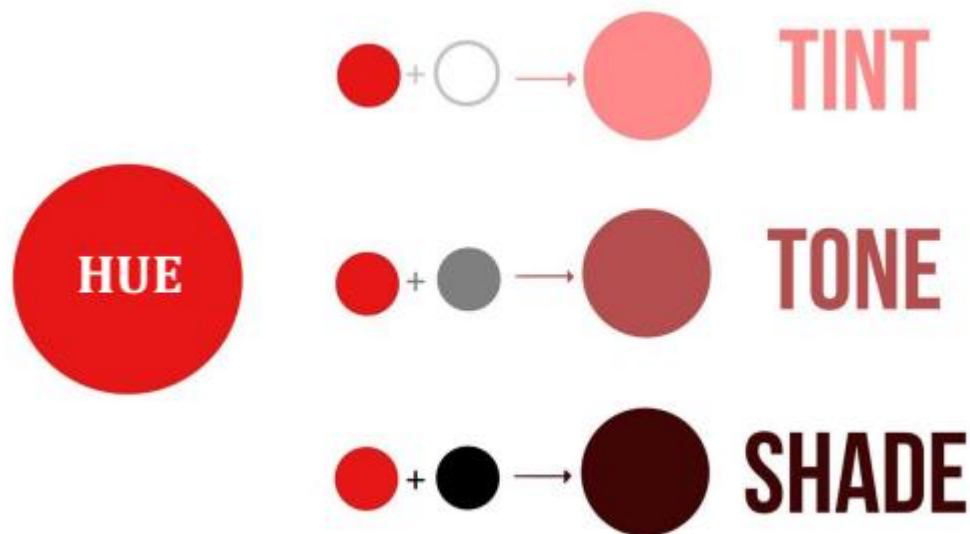
- 4) **Achromatic colours scheme-** An achromatic colour scheme is simply colourless scheme possessing no hue, using only black, white and grey. These are all shades of black, white and grey.
- 5) **Triadic colour scheme-** any three colours with a balanced triangular relationship on a colour wheel collectively make a triadic colour scheme. For eg- Red, Yellow and Blue.
- 6) **Warm/cool colour scheme-** The range of colours which gives a feeling of warmth are known as warm colours. For eg- red to yellow-green.
The range of colours which given a cool and calm feeling are known as cool colours. For eg- green to red-violet.
- 7) **Monochromatic colour scheme-** This colour scheme is designed with a single colour called hue and its tints, shades and tones. This colour scheme appears very soothing, subtle and pleasing to the viewer. For eg- Red is the hue then pink would be its tint and maroon will be its shade.

Hue: hue is defined as the purest form of the colour. For eg- green, blue, red, yellow etc

Tints: tints are formed by mixing white with hue in some proportion. For eg- red+white = pink

Shades: shades are formed by mixing black with hue in some proportion. For eg- red+black = maroon

Tones: tones are formed by mixing grey with hue in some proportion. For eg- red+grey = De-saturated red



Colour Psychology

Colours have qualities that can evoke certain emotions in humans. Colour psychology is the study of how certain colours impact human behaviour. Different colours have different meanings and evoke different kinds of emotions, let's learn them one by one:

White:

The color white is color at its most complete and pure, the color of perfection. The psychological meaning of white is purity, innocence, wholeness and completion.

White contains an equal balance of all the colors of the spectrum, representing both the positive and negative aspects of all colors. Its basic feature is equality, implying fairness and impartiality, neutrality and independence. White encourages clarity of thought/clear thinking.

Green:

Green is the color of balance, harmony and growth. Green is a color that can evoke powerful emotions. It is a dominant color in nature that makes you think of growth. Green is universally associated with nature, linked as it is to grass, plants and trees. It also represents renewal, being the color of spring and rebirth. Green makes you feel optimistic and refreshed. Green symbolizes health, new beginnings and wealth. Green is the easiest on the eyes and should be used to relax and create balance in a design.

Red:

Red attracts the most attention and is associated with strong emotions, such as love, passion, and anger. It's the universal color to signify strength, power, courage, and danger. Red is vibrant, stimulating and exciting and motivates one to act. Red has a range of symbolic meanings through many different cultures, including life, health, vigor, war, courage, anger, love and religious fervor. It's warm and positive, generally associated with our most physical needs and our will to survive. It exudes a strong and powerful masculine energy. It enhances metabolism, increases respiration rate, and raises blood pressure.

Orange:

This is the hue of encouragement, optimism, and self-confidence, marking the extrovert. Orange radiates warmth and happiness, combining the physical energy and stimulation of red with the cheerfulness of yellow. Orange can inspire courage, enthusiasm, rejuvenation, and vitality. It can also have a stimulating effect, particularly on the appetite.

Orange calls to mind feelings of excitement, enthusiasm, and warmth. Orange makes you feel energized and enthusiastic. Orange enhances a feeling of vitality and happiness. Like red, it draws attention and shows movement but is not as overpowering. It is aggressive but balanced — it portrays energy yet can be inviting and friendly.

Violet:

Purple combines the calm stability of blue and the fierce energy of red. The color purple is often associated with royalty, nobility, luxury, power, and ambition. Purple also represents meanings of wealth, extravagance, creativity, wisdom, dignity, grandeur, devotion, peace, pride, mystery, independence, and magic. This color is a mixture of red and blue, so it relates to performance shine and dignity, but has a calming influence. The psychological effects of the violet are creativity, thinking, artistic inspiration, intuitiveness, protectionism, mystery, spirituality.

Blue:

Blue calls to mind feelings of calmness or serenity. It is often described as peaceful, tranquil, secure, and orderly. Blue is often seen as a sign of stability and reliability. The color blue represents both the sky and the sea and is associated with open spaces, freedom, intuition, imagination, inspiration, and sensitivity. Blue also represents meanings of depth, trust, loyalty, sincerity, wisdom, confidence, stability, faith, and intelligence. Colors on the blue side of the spectrum are known as cool colors and include blue, purple, and green. These colors are often described as calm, but can also call to mind feelings of sadness or indifference.

Yellow:

The radiant color of yellow promotes happiness and optimism in the observer. Yellow is said to promote happiness more than any of the other major colors. Yellow is a color associated with sun. It symbolizes optimism, energy, joy, happiness and friendship. Yellow is a strange colour: it is often associated with happiness, but also activates the anxiety centre of the brain. Like red and orange, it's able to stimulate and revitalise – it's the colour of warning signs and taxis.

Black:

In color psychology, black's color meaning is symbolic of mystery, power, elegance, and sophistication. In contrast, the color meaning can also evoke emotions such as sadness and anger. Black has a wide range of associations. It can be linked with death, mourning, evil magic, and darkness, but it can also symbolize elegance, wealth, restraint, and power.