Diploma in Textile and Fashion Designing

PAPER I: FUNDAMENTALS OF TEXTILES DESIGNING (THEORY)

SYLLABUS

Unit 1: Introduction

| S.No. | Title | Details |
|---|---|---|
| 1. | Terminology | textile, fiber, yarn, fabric, weaving, knitting, dyeing, printing, design, layout, warp, weft, selvedge, course, wale, motif, embroidery, ornamentation |
| 2. | Fiber Classification | Classification Chart-<br>Natural fibers (cotton, jute), animal fibers (wool, silk) Synthetic/ manmade fibers (nylon, polyester, rayon, acrylic) |
| 3. | Comparative analysis | Natural and synthetic fibers<br>Fiber and filament, yarn |
| 4. | Fabric Quality analysis | Washing fastness, light fastness, rubbing fastness, fabric thickness, fabric shape, fabric strength, fabric weight |
| 5. | Basic Fabric Properties | Study of fabrics (cotton, silk, rayon, wool, georgette, chiffon, velvet, corduroy, linen, satin, nylon) for their end use purposes on following parameters-<br>Appearance- colour, luster, shape<br>Performance- strength, flexibility, elasticity, absorbency, electrical conductivity, dimensional stability, effect of heat, drapability, stiffness |

Unit 2: Weaves and Fabric Construction

| S.No. | Title | Details |
|---|---|---|
| 1. | Loom | Definition - handloom, power loom<br>Difference between handloom and power loom |
| 2. | Loom Parts | Loom and its parts |
| 3. | Weaving Process | Primary and secondary motions of the loom- shedding picking beating-up let off motion take up motion |
| 4. | Basic Weaves | Plain weave, twill weave, satin/sateen weave |
| 5. | Non-woven fabric | Basic non-woven fabric construction techniques -felting, fusing, bonding , netting, braiding, tatting and crocheting |

Unit 3: Surface Ornamentation

| S.No. | Title | Details |
|---|---|---|
| 1. | Surface ornamentation | Meaning and definition, importance and role in apparel designing |

| | | |
|---|---|---|
| 2. | Basic types | Printing, dyeing, embroidery, appliqué, quilting, patch work, smoking, trim, fringe, piping, painting |
| 3. | Printing and dyeing | Basic hand printing process: block printing, stencil printing, hand painting, tie and dye<br>Differences between dyeing and printing |
| 4. | Embroidery | Difference between hand and machine embroidery<br>Tools used for hand embroidery, principles of embroidery (tools, thread, design, fabric selection, neatness and finishing) |
| 5. | Embroidery pattern | Design transfer techniques- direct drawing, transfer paper, carbon paper, tracing table, butter paper, tracing wheel, running stitch method<br>Design selection criteria for apparel use- saree, necklines & sleeves of kurta, blouse, frocks, toppers, duppata |

Unit 4: Elements of Design

| S.No. | Title | Details |
|---|---|---|
| 1. | Elements of Design | Meaning & definition- line, shape, form, colour, texture |
| 2. | Line types | Effect on appearance - straight (horizontal, vertical, diagonal lines), curved, jagged lines |
| 3. | Common shapes, forms, Texture | • Oval, circle, square, rectangle, triangle<br>• Difference between shape and form<br>• Smooth, soft, rough, clingy, stiff, bulky, shiny, dull, light, heavy textures in fabric |
| 4. | Colour and effect | Properties of colour- hue, value and intensity<br>• Primary, secondary, tertiary colours<br>• Tints and shades<br>• Cool & warm colour<br>• Psychological effect of red, white, black, yellow, blue, green, violet,dark colour, light colour, bright colour, dull colour |
| 5. | Colour wheel & Colour Schemes | Monochromatic, Analogous, Complementary, Split-Complementary, Double Split-Complementary, Triad, Tetrad colour schemes |

Unit 5 : Principles of Design

| S.No. | Title | Details |
|---|---|---|
| 1. | Principles of design | Meaning & definition-, balance, emphasis, proportion, rhythm, harmony |
| 2. | Balance & Proportion | Formal, informal, radial balance<br>Golden rule of proportion |
| 3. | Emphasis | Creating emphasis in apparels |

| | | |
|---|---|---|
| 4. | Rhythm | Rhythm through repetition, progression, radiation |
| 5. | Harmony | Principles of harmony |

Unit 1: Introduction

# TEXTILE TERMINOLOGY

**TEXTILE**- Originally, a woven fabric; now applied generally to any one of the following- 1. Staple fibers and filaments suitable for conversion to or use as yarns, or for the preparation of woven, knit, or nonwoven fabrics. 2. Yarns made from natural or manufactured fibers. 3. Fabrics and other manufactured products made from fibers as defined above and from yarns. 4. Garments and other articles fabricated from fibers, yarns, or fabrics when the products retain the characteristic flexibility and drape of the original fabrics

**FIBER:** A unit of matter, either natural or manufactured, that forms the basic element of fabrics and other textile structures. A fiber is characterized by having a length at least 100 times its diameter or width. The term refers to units that can be spun into a yarn or made into a fabric by various methods including weaving, knitting, braiding, felting, and twisting. The essential requirements for fibers to be spun into yarn include a length of at least 5 millimeters, flexibility, cohesiveness, and sufficient strength. Other important properties include elasticity, fineness, uniformity, durability, and luster.

**YARN** - A continuous strand of textile fibers created when a cluster of individual fibers are twisted together. These long yarns are used to create fabrics, either by knitting, plaiting, or weaving.

**FABRIC:** A planar textile structure produces by interlacing yarns, fibers, or filaments.

**WEAVING**- The method or process of interlacing two yarns of similar materials so that they cross each other at right angles to produce woven fabric. The warp yarns, or ends, run lengthwise in the fabric, and the filling threads (weft), or picks, run from side to side. Weaving can be done on a power or handloom or by several hand methods.

**KNITTING** - The art and science of constructing fabric by interlooping of yarn loops, through the use of needles and a "loop within a loop". The most essential unit in a knit fabric is the loop or stitch. A vertical row of stitches is called a WALE; the horizontal or crosswise row of stitches is known as a COURSE. The number of wales per inch, measured across the fabric depends on the count or size of the yarn used, and the number of needles per inch in the machine. The two major classes of knitting are warp and weft.

**DYEING**: A process of coloring fibers, yarns, or fabrics with either natural or synthetic dyes.

**PRINTING**- A process for producing a pattern on yarns, warp, fabric, or carpet by any of a large number of printing methods. The color or other treating material, usually in the form of a paste, is deposited onto the fabric which is then usually treated with steam, heat, or chemicals for fixation.

**DESIGN**-A design is a plan or specification for the construction of an object or system or for the implementation of an activity or process, or the result of that plan or specification in the form of a prototype, product or process

**LAYOUT**-The placement of pattern on the fabric, in an economical manner, that is without wasting fabric is known as pattern layout. All the patterns should be arranged prop-erly following grain of the fabric. Example the bodice centre front will be in straight (lengthwise direction) grain.

**WARP**-1. The set of yarn in all woven fabrics, that runs lengthwise and parallel to the selvage and is interwoven with the filling. 2. The sheet of yarns wound together on a beam for the purpose of weaving or warp knitting.

**WEFT** - In woven fabric, the filling yarns that run perpendicular to the warp yarns.

**SELVEDGE** - The thin compressed edge of a woven fabric which runs parallel to the warp yarns and prevents raveling. It is usually woven, utilizing tougher yarns and a tighter construction than the rest of the fabric. Other names for it are listing, self-edge, raw edge.

**COURSE** - The rows of loops or stitches running across a knitted fabric. Corresponds to the weft or filling in woven goods.

**WALES** - In a knitted fabric, the series of loops that are formed by a single needle, which runs vertically or lengthwise in a knitted fabric.

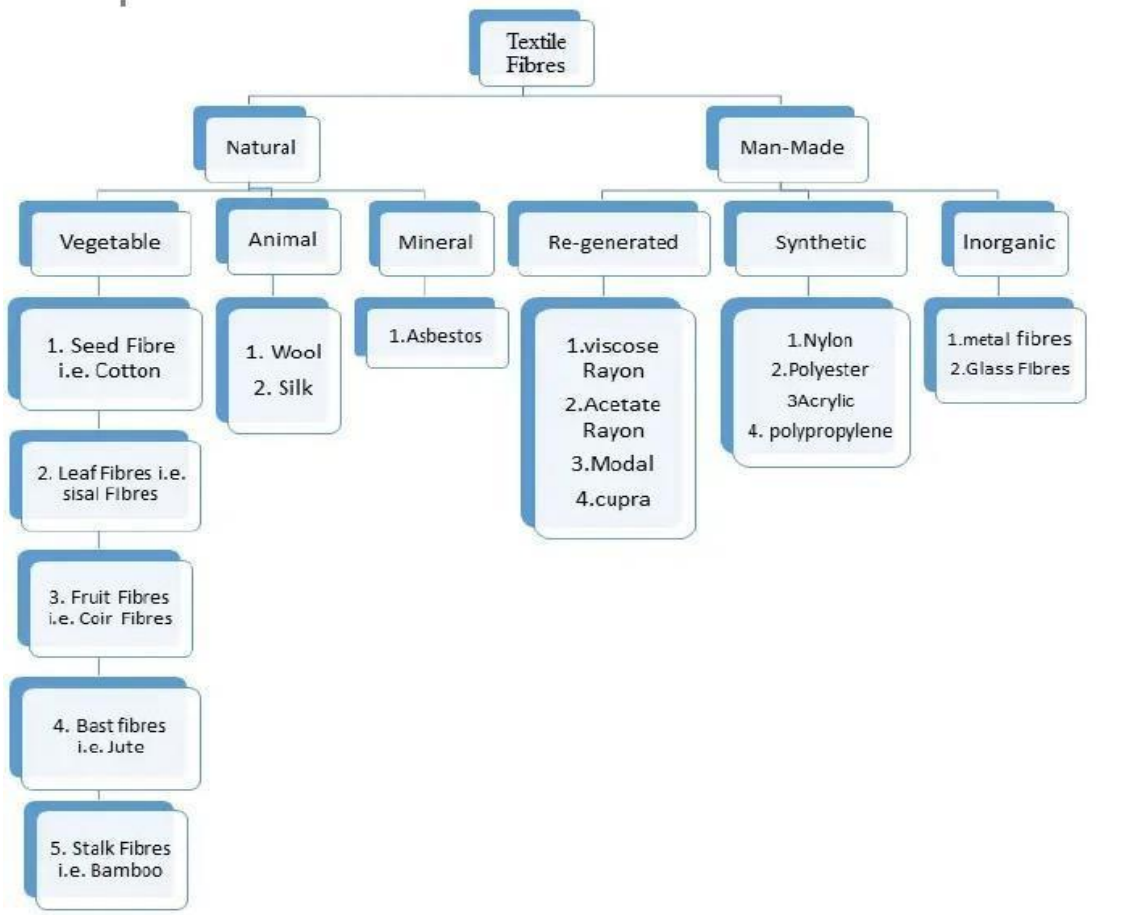
**MOTIF**-A decorative image or design, especially a repeated one forming a patternare images, ideas, sounds, or words that help to explain the central idea of a literary work .

**EMBROIDERY**-Method of decorating fabric with designs stitched in coloured thread or yarn.

**ORNAMENTATION**- ornamentation adds immense beauty and enhances the look of a garment. The main idea of fabric decoration is to add an element of interest. The most common materials used for surface ornamentation are mirrors, beads, sequins, threads, wires, buttons, etc. Surface ornamentation is a skill.

## 2 FIBRE CLASSIFICATION

Textile fibres can be defined as the textile substance that is very small in diameter in relation totheir length or in other words fibre is the material which is several hundred times longer than itsthickness. Fibre is the basic component of any textile material. There are different types of fibresaround us in daily use. Fibres with a short length are called as staple fibres, whereas fibres withlong length are called as filaments.




Types of Textile Fibres
1.Natural Fibres 2.Man-Made Fibres

Natural Fibres-Fibres which are obtained from the natural origin directly or indirectly referred as natural fibres.

Fibres obtained from the natural origin can be further sub-classified into three different categories based on their different natural origins. Classification of natural fibre is as follows –

1. Vegetable Fibres

2. Animal Fibres

3. Mineral Fibres

**1.Vegetable Fibres**-These fibres are basically cellulosic fibres. Besides their use as textiles, these fibres are also used in the manufacturing of papers. Vegetable fibres are basically obtained from various parts(Organs) of the plants such as seeds, bast, leaf, fruit, stalk, etc.

Seed fibres are obtained from seeds such as cotton, kapok, etc. the cotton fibres are widely used for the apparel purpose, medical uses, and other textile applications.

Leaf fibres are obtained from leaves of plants such as Palf, sisal, agave, etc. Leaf fibres are used for marine ropes and cement reinforcement.

Fruit fibres are obtained from the fruit of the plant such as coir fibre (coconut fruit). These fibres are mainly used for manufacturing doormats, carpets, etc.

Bast fibres are obtained from the bast surrounding to the stem of the plant. Such as jute, hemp, flax, ramie, etc. These fibres have more strength, durability and do not get affected by moisture so that they are used for manufacturing durable yarns, fabrics, packaging material and paper.

Stalk fibres are extracted from stalks of the plant – such as straws of rice, wheat, and other crops. Bamboo and grass fibre is also included.

1 COTTON AND ITS PROPERTIES

**Cotton -**

- Cotton fibers are natural hollow fibers; they are soft, cool, known as breathable fibers and absorbent.
- Cotton fibers can hold water 24–27 times their own weight.
- They are strong, dye absorbent and can stand up against abrasion wear and high temperature.
- Cotton is comfort
- Cotton is the most important natural textile fiber, as well as cellulosic textile fiber, in the world, used to produce apparel, home furnishings, and industrial products.
- .Cotton fibers are seed hairs from plants of the order Malvales, family Malvaceae, tribe Gossypieae, and genus Gossypium. Botanically, there are four principal domesticated species of cotton of commercial importance: hirsutum, barbadense, aboreum, and herbaceum.

**Growth**

The wild cotton plant was domesticated in Asia, Africa, and South America nearly six thousand years ago. Ancient Egyptians made fine cloth at least four thousand years ago. Their hand-spun cotton was as fine as for today's best. Today, cotton is grown on 77 million acres in over 80 countries – anywhere the growing seasons are long and hot. Cotton grows on bushes that are three to six feet high. Its flowers last for five to seven days.

The boll is a seedpod about the size of a golf ball. It begins to grow after the flowers drop off.

Inside are 7 or 8 seeds, and attached to them are the cotton fibers. Each seed may have as many as twenty-thousand fibers – that's as many as one hundred fifty thousand individual fibers in each boll!Cotton is threatened by the boll weevil. It's a beetle feeds on bolls and the blossoms. Each year the weevil causes around two hundred million dollars of damage to the cotton crop in the US alone. So cotton is treated with insecticides, often by airplanes.

## Harvesting

Cotton was once harvested by hand, often by slave labor or tenant farmers. As recently as 1965, over a fourth of the U.S. cotton crop was picked by hand. Today, harvesting cotton is highly mechanized. Harvesting machines called strippers and pickers efficiently remove the cotton while leaving the plants undisturbed. Spindle harvester, also called a picker, has drums with spindles that pull the cotton from the boll in one or two rows at a time. Even a one-row mechanical picker can do the work formerly done by 40 hand pickers.

In stripper harvesting, the stripper moves along rows of plants, passing them between revolving rollers or brushes that pull off the cotton. Strippers also pull twigs and leaves with the cotton.

Cotton gins separate the fibers, called lint, from the seeds. After ginning, the cotton goes to the bale press that packs it into 480-pound bales about the size of a large refrigerator.

## Classing Cotton

Cotton buyers judge cotton on the basis of samples cut from the bales. Skilled cotton classers grade or "class" the cotton according to standards established by the US Department of Agriculture such as cleanliness, the degree of whiteness, length of the fiber, and fiber strength.The classes pull a sample. They discard most of the cotton until just a pinch of well-aligned fibers remains. They measure the length of the fibers, referred to as staple fibers. Longer staple fibers are higher-grade cotton and are sold at higher prices. Long staples range from 1.1 inches to 1.4 inches long.

**Properties & Uses**

The fibers are sent to a textile mill where carding machines turn the fibers into cotton yarn. The yarns are woven into cloth that is comfortable and easy to wash but does wrinkle easily. Cotton fabric will shrink about 3% when washed unless pre-treated to resist shrinking.Cotton is prized for its comfort, easy care, and affordability and is ideal for clothing, bedding, towels, and furnishings.

Comfortable to wear
Natural, cellulosic fiber
Made from the cotton boll
Absorbs water and "breathes"
Slow to dry
Resists static electricity build-up
Wrinkles easily
Can withstand heat, detergents, and bleach
About 20% stronger when wet than dry
Will shrink unless treated Can
be damaged by mildew
Can be damaged by prolonged exposure to sunlight

Long staple cotton (such a Supima, Pima, Egyptian, and Sea Island) can be woven into smooth, almost silky fabrics.

**2 JUTE FIBRES**

Jute is known as golden fibre because of its golden color & it will bring a golden future for Bangladesh. In terms of usage, production and global consumption, jute is second

only to cotton. Once upon a time before liberation it was the main exporting goods and was sold in raw & finished goods. Jute is a bast fiber used for sacking, burlap, and twine as a backing material for tufted carpets.roperties of Jute Fibers

**1- Physical Properties**

Dimensional stability of jute: Average good.
Jute color: Jute fibers can be white, yellow, brown, gray or golden. Jute fiber length: 150 to 300 cm.
Elongation: 1.7% at the break.
Flexibility: Bad.
Specific gravity: 1.48.
Jute strength: 3 to 5g / den. Moisture regain: 13.75% (standard). ..

**2- Chemical Properties**

Alkali Effect: Diluted alkalis have no effect on jute fibers, but strong alkali at boiling causes a loss of strength.

Acid effect: A strong acid during boiling causes hydro cellulose leading to a loss of strength but dilute acid has no effect on jute fibers.

Bleaching effect: Jute fibers are not affected by the oxidizing and reducing agent. Effect of organic solvent: Jute is a good resistant to organic solvent.
Sunlight Effect: As lignin is present in jute fibers, it may be damaged by sunlight. Effect of microorganisms: Jute has resistance to microbiological attack.
Dye ability: Jute fibers have a good ability for basic dye.

## 2. Animal Fibres

The fibres are obtained from animals are called as animal fibres. The fires are mainly made up of protein molecules. The basic element of a protein molecule is carbon, nitrogen, hydrogen, oxygen.

**Wool (**Hair fibres obtained from the animals) & silk fibres are common examples of animal fibres.The fibres obtained from the sheep are referred as wool fibres, in the way the hair of the horse, camel, goat are also obtained as fibre. 90% of hair fibres are wool fibres used various applications.

**Silk** is a very delicate filament. It is obtained from silkworms. Silk formation takes place by the secretion of proteinous molecules in liquid form through the glands of the silkworm, It is located on the head of the worm. This liquid proteinous material gets converted into a solid filament. During this secretion process, the worm forms cocoons from which silk is extracted. The sericulture of the silkworm is called as the rearing of the silkworm.The Fibres obtained from the feathers of the birds are called avian fibres.

**3.Mineral Fibres**These are the inorganic materials shaped into fibres. Asbestos is an example of mineral fibre. These fibres are fireproof, resistant to acid so that these fibres are mainly found in the industrial application.

### Man-Made Fibres

As the name itself indicates these textile fibres are made by man to meet the particular requirements.The chemical composition, structure, and properties are significantly modified during the manufacturing process.

Depending on the raw material chosen for making these textile fibres – fibres can be further sub classified into 3 categories –

1. Regenerated Man-Made

2. Synthetic Fibres

3. In-Organic Fibres

**1.Regenerated Synthetic**-Regenerated synthetic textile fibres are also called as semi- synthetic fibres.These fibres are made up of naturally long chain polymer structure, which is modified and partially degraded by a chemical process to enable the polymerization reaction to form the fibres. Most of the semi-synthetic fibres are called cellulose regenerated fibres.Examples: Viscose rayon, modal, cupra (Rayon), bamboo viscose, tencell.The cellulose required comes fromvarious sources such as rayon from the tree wood, modal from the beech trees, seacell from seaweed.In the manufacturing process of these fibres, cellulose is fairly reduced to the pure viscose form and then foam and then foamed into the fibre form by extrusion through the spinnerets.

**2.Synthetic Fibre-**Synthetic fibres are manufactured from the petrochemicals.Examples

– Polyester, nylon, acrylic, etc.These fibres are formed by the polymerization of monomers. Once the polymer is formed, it can be formed into a filament by converting that polymer into fluid form and then extruding the molten or dissolved polymer through narrow holes to give filaments. To form the fibre from molten polymer it gets passed through the spinneret.An alteration in structure, design and in other words – aspects of yarn can be done by altering the polymers used for it.These fibres are generally very strong, fine and durable with very low moisture absorbency property so that these fibres are also called as hydrophobic fibres.In-Organic FibreThese textile fibres are also called as metallic fibres.

Metallic fibres are drawn from the ductile metals such as copper, gold, silver and can be extruded or deposited from more brittle such as nickel, aluminum and iron. From stainless steel also fibres can be formed.These fibres are not that much widely used but these fibres have their special applications in technical textile.

**1.NYLON-**

- Nylon is a man-made synthetic fiber that is strong while very light in weight.
- It is used inmaking rope and luggage.
- This fiber was first introduced in the 1930s as an early substitute for silk; it eventually became the fiber of choice for women's stockings.
- Chemist Wallace H. Carothers of the Dupont Company was one of the lead players in the development of nylon fiber.
- Nylon is one of the most popular manmade fibers.
- Nylon is very strong and elastic
- It is easy to wash.
- Nylon dries rather quickly and it retains its shape rather well after laundering, which ensures longevity of the garment.
- Nylon fiber is very responsive and resilient as well as relatively resistant to heat, UV rays and chemicals.

Uses of Nylon

- One of the most common uses for nylon is in women's stockings or hosiery.
- It is also used as a material in dress socks, swimwear, shorts, track pants, active wear, windbreakers, draperies and bedspreads.
- It also includes flak vests, parachutes, combat uniforms and life vests, in manufacturing

umbrellas, luggage and the netting for bridal veils.

**2.POLYESTER-**

- polyester fibers are made of ethylene. Which could be an integral of petroleum which will even be derived from other sources.
- some sorts of polyester are biodegradable, most of them aren't, and polyester production and use contribute to pollution round the world.
- polyester is easy to be blended with cotton or another fiber.
- Use of polyester in clothing lessens production costs,
- Polyester also decreases the comfort ability of clothing.When blended with cotton, polyester improves the shrinkage, durability, and wrinkling profile of this widely-produced fiber. Polyester fabric is very proof against ecological conditions. Which makes it ideal for long-term use in outdoor applications.

Uses of polyester

- Fabrics made from polyester thread or yarn is used expansively in apparel and home furnishing products. Those products from shirts and pants to jackets and hats, bed sheets, blankets, upholstery furniture and computer mouse mats.
- Industrial polyester fibers, yarns and ropes are used in tyre strengthening process
- 
- Polyester fabrics used for conveyor belts, safety belts, coated fabrics and plastic supporting with high-energy absorption.
- Polyester fiber is used as cushioning and padding material in pillows, quilts and upholstery stuffing.
- Polyesters are also used to make bottles, films, oilcloth, sheeting, canoes, liquid crystal flaunts, holograms, filters, dielectric film for capacitors, film insulation for wire and insulating tapes.
- Polyesters are widely used as a finish on first-class wood products such as guitars, pianos and automobile/ship interiors.

## **2.** RAYON

Rayon is a man-made redeveloped cellulose fiber.
Rayon is produced from naturally occurring polymers; it may be a really artificial fiber or completely a natural fiber…..Man- made redeveloped cellulose fiber
Rayon is a semi-synthetic or artificial fiber.
Rayon is recognized by the name viscose rayon and art silk in the textile industry.
Rayon fibre is a synthetic textile material which is fully the collection of cellulose acquired from cotton linters or from the soft tissue of trees such as spruce.

Very first rayon was called artificial silk because it is in filament form and somewhat resembles silk material. However, this similarity is deceptive because the chemical composition of rayon is totally varied from the chemical composition of silk fibres.

Rayon is very soft, cool, comfortable and very good absorbent property but could not be able to protect body heat and used in humid steamy climatic conditions.

Rayon fibre has the same comfort property as natural fibres. Rayon can replicate the feel and texture of silk, cotton, linen and wool.Rayon can easily be dyed in variety of colors .Rayon has very lower elastic recovery of any fibre.Rayon typically has an elevated luster quality giving it a brilliant gloss

Uses of Rayon

- Rayon fibres are used in apparel industry such as Aloha shirts, blouses, dresses, Jackets, Lingerie, scarves, suits, ties, hats and socks…,
- Some rayon fibres are for filling in Zippo lighters, furnishings including bedspreads, bedsheets, blankets, window covers, upholstery and slipcovers..,
- industrial purposes such as medical surgery products, non-woven items, tire cord and some other uses like diapers, towels, feminine hygiene products..,

# 4 ACRYLIC FIBRE

Acrylic is a synthetic man-made fiber which was created to mimic wool and it does bear some resemblance to it in softness.Some brand names for acrylic are Acrilan, Orlan, and Creslon. The fiber has a soft, smooth feel which is very similar to wool, and is lightweight. It is often used to create plush velvets, and dyes beautifully.

Acrylic fiber fabrics are made from a synthetic polymer called acrylonitrile. This type of fiber is produced by reacting certain petroleum or coal-based chemicals with a variety of monomers, which means that acrylic fabric is a fossil fuel-based fiber.

Since acrylic fabric is one of the least breathable forms of textiles in the world, it is desired in heat-retention applications. However, there are concerns that acrylic may be carcinogenic, so it may be prudent to avoid contacting this fiber with your skin.

Acrylic can be thought of as artificial wool. It is made from the unlikely combination of coal, air, water, oil and limestone. DuPont first made acrylic fibers in 1944 and began commercial production in 1950. It is spun by either dry spinning or wet spinning. In dry

spinning the dissolved polymers are extruded into warm air. The fibers solidify by evaporation. In wet spinning the polymer is dissolved and extruded into a bath and then dried. In some ways, acrylic imitates wool. It has wool's warmth and softness, but does not absorb water. Instead, acrylic wicks moisture to the surface where it evaporates.

Uses of Acrylic

Acrylic is used in knitted apparels such as fleece, socks, sportswear and sweaters. It is also used to create fake fur, craft yarns, upholstery fabric, carpet, luggage, awnings, and vehicle covers.

Ist is commonly used in athletic equipment, and it’s common to see tracksuits, hoodies, and athletic pants made from acrylic fabric.

## 3.**COMPARATIVE ANALYSIS**

**Natural and synthetic Fibre**

**Natural fibres:**

- Fibres produced by plants or animals are called natural fibres. Best examples of plant fibres are: linen and cotton. Examples of animal fibres are: wool and silk.
- They have a natural color. Incase coloring is required then dying is very easy.
- Natural fabrics are comfortable to wear.
- It is environmentally friendly.
- On burning it turns into ash.

**Synthetic fibres:**

- Man made fibres created in laboratories are called synthetic fibres. Examples of synthetic fibres are acrylic, nylon and polyester.
- Colors can be added as per required. Coloring is difficult.
- Theses fabrics are not comfortable to wear when compared to natural fibres.
- It is not environmentally friendly because some fibres like polypropylene are harmful.
- On burning it melts and gives out a chemical smell.
- These fibres are more durable than natural fibres.

Difference between Natural and Synthetic fibres

1. Natural fibers are made from nature, whereas synthetic fibers are entirely human-made.
2. The length of natural fibers is decided by nature. Conversely, the length of synthetic fibers is decided by man.
3. The number of molecules in natural fibers is controlled by nature. On the flip side, the number of molecules in synthetic fibers is controlled by man.
4. Natural fibers have an unlimited number of molecules. On the other hand, synthetic fibers have a limited number of molecules.
5. Natural fibers are nature dependent. In contrast, synthetic fibers are not dependent on nature.
6. Natural fibers can grow everywhere, whereas synthetic fibers cannot grow everywhere.
7. Natural fibers are found in staple or filament form, while synthetic fibers can be found in staple, filament, or cut length form.
8. The spinneret is not needed during the spinning process for natural fibers production. Conversely, the spinneret is used during the spinning process of synthetic fibers.

9. No spinning process is required for filament production in natural fibers. On the other hand, the spinning process is an essential requirement for filament production in synthetic fibers.
10. Natural fibers do not need chemical solutions for yarn production, whereas synthetic fibers need chemical solutions for yarn production.
11. Natural fibers are comfortable to wear and good for health. On the flip side, synthetic fibers are not comfortable to wear and also not good for health.
12. Natural fibers are easy to dye, whereas synthetic fibers are difficult to dye.
13. Natural fibers are environment friendly, while synthetic fibers are not environmentally friendly.
14. Natural fibers are decomposable. Conversely, synthetic fibers are non-biodegradable.
15. Natural fibers are expensive. In contrast, synthetic fibers are cheap.

## 2 **FIBRE ,FILAMENT AND YARN**

**Filament fibers** refer to fibers of long continuous lengths.A filament is usually a man-made fiber of indefinite length. Filament fibers are measured in yards or meters.Synthetic fibers, such as nylon and polyester, are considered filament fibers. The natural fiber silk is also a filament fiber. Silk, in filament form, is reeled from cocoons. Man-made fibers of a chemical composition, liquid nature are forced through spinnerets, hardened and produced into continuous filament strands of a determined length

**staple fibers** refer to those of shorter lengths, which are about a few inches long. Staple fibers are measured in inches or centimeters .Most natural fibers, such as cotton and wool, are staple fibers.when filament fibers are cut short, they are considered staple fibers.

- Any fiber with a practical, limited or finite length is called “Staple Fiber” These are small length fiber like cotton, wool, jute etc. it may be natural (Cotton) or man-made (Viscose rayon, Polyester).Staple fibers include almost all natural fibers except silk. Silk is a natural filament fiber and may be cut up to form short staple fibers. Staple fibers must be spun or twisted together to make a long continuous strand of yarn. They may also be used in their staple form to produce non-woven or felted fabrics.A staple is the fiber of cotton, wool or ramie etc of no more than a few inches long.

The filament fibers are grouped into a bundle referred to as a tow and then cut into the desired staple length. Line or low man-made fibers are manufactured in continuous strands of any desired length. The tows may be cut into staple lengths or flocks based on specific end use.

. All fabrics woven, knitted or crocheted are made from yarn. The size of yarn has usually related the weight of the fabric eg. heavy fabrics use thick yarns, for light fabrics fine yarn is used. ll fibers having a practically unlimited or infinite length are called filaments. Filament fibers are continuous (long) fiber. It may be natural like silk or synthetic like Nylon.All man-made fibers are filament fibers, but only one natural fiber is filament fiber that is silk. Filaments are of two types; mono-filament and multi-filament.

Yarn is made by twisting together of fibers to make a strong product for manufacture of fabrics.Yarns are the continuous, short and staple fibre strands made. These materials range in size and structure and form a suitable textile cloth for knitting, weaving or otherwise intertwining.

# 4. FABRIC QUALITY ANALYSIS

What is Fabric Testing?

Normally garment is produced from fabric. The fabric can be woven or knitted or knit fabric, solid color dyed, printed, check, or stripe that is finished fabric. Before making garments from those fabrics especially for large quantities. It should be kept in mind that the garment may be rejected by the buyer due to some quality problem of the fabric although the fabric may be brand new. To avoid such kinds of problems, fabrics have to test to identify their actual quality before making the garments and it is called fabrics testing.

Objects of Fabrics Testing:

The reasons for carrying out tests on fabrics are numerous and some common ones are pointed out below:

To check that the fabric conforms to fabric specification. To
note the effect of changes in structural details.
To note the effect of physical and chemical treatment, exposure to weather or laundering or washing, etc.

To obtain some identification of probable performance in use. To
investigate the causes of failure and customers complain.s To help in
designing a fabric for a specific purpose.
To study the interaction of fiber, yarn, and fabric properties.

Resistant to light fastness-Light fastness or color fastness to light is that the resistance of the dyes or pigments used for coloration to tinting or change in color to exposure in direct sunlight or any artificial light. Different end uses of cloth would require

different levels of fastness towards the sunshine.Dyeing fabric resistant to light fastness, refers to the fabric after dyeing in the long-term sunlight, under the fade.

The outcomes of fading are different for the same dyestuffs on different fibres. E.g. the fading of azo dyes on cellulosic fibers is oxidation, and fading on protein fibers is a reducing effect.

The resistance to light fastness of the dye is also related to its molecular structure. E.g. some metal complex dyes are resistant to high fastness, while insoluble azo dyes are resistant to light fastness.

The resistance to light fastness is also related to the dye concentration at the time of dyeing. Resistance to light fastness assessment is based on “blue standard” as the basis. The so-called “blue standard” refers to the use of the specified dye in a certain concentration of blue wool fabric. The general concentration is high resistance to light fastness with low concentration of sun fastness is relatively good. The exposure time required for the sun to fade under the prescribed conditions is roughly doubled.

Lightfastness is measured by Spectrophotometer

Friction or Rubbing fastness-Friction fastness is the ability to withstand discoloration due to friction between fibres of the same fabric.The friction fastness of the dyed fabric is divided into dry friction fastness and wet friction fastness.

Dry friction fastness is reflected in the dry cloth after the white cloth stains, wet friction fastness is reflected with the water content of 95% to 100% of the white cloth after the friction of the situation. Generally wet friction fastness is lower than dry friction fastness. The frictional fastness of the fabric depends on factors like the amount of the float and the combination of the dye and the fiber, the permeability of the dye, and so on. In reactive dyes and fibers that are covalently bonded, dry friction fastness is very good.

The higher the dyeing concentration is, the lower the friction fastness is. Friction fastness test carried out on a Crock meter

Washing Color Fastness- Color fastness refers to the resistance of color to fade or bleed of a dyed or printed textile materials to various types of influences e.g. water, light, rubbing, washing, perspiration etc. It is an important indicator to measure the quality of dyeing products.

Due to the use of chemicals in the late processes of dyeing and finishing, like acid, alkali, oxidants, reductants, etc., and when using in washing, sunlight, rubbing, sweat, high temperature and so on, dyeing textiles may fade or discolor. Therefore, dye color fastness is diverse, including washing fastness, light fastness, rubbing fastness, perspiration fastness, chlorine fastness, ironing fastness, etc.

The color fastness requirement of textiles is different because of their different use and process. For example, the curtain which is less washed requires low Color Fastness, but due to exposure to the sun for a long time, it needs high lightfastness. Summer clothing fabrics should have higher light fastness, washing fastness and perspiration fastness for the reason that they always expose to sun and human body always sweats.It is measured by Lasundrometer

Fabric thickness is the most important variable determining the rate of heat transfer and hence the so-called ‘warmth’ of the fabric. Fabric thickness affects air permeability and moisture absorbency and also has a great influence on the abrasion resistance.Fabric thickness is defined as perpendicular distance through the fabric, which determines the dimension between the upper and lower side of the fabric. In order to determine the thickness of a compressible material such as textile fabric, the precise measurement of the distance between two parallel plates should be measured when they are separated by the cloth. A known arbitrary pressure between the plates should be applied and maintained.

It is useful to measure fabric thickness, in order to check the material against the specification.Fabric thickness is also useful in studying fabric properties such as thermal insulation, resilience, dimensional stability, fabric stiffness, abrasion and total handle value.

It is also useful when studying fabric geometry.

Determination of thickness of fabric samples in laboratory is usually carried out with the help of a precision thickness gaugeInstruments for measuring fabric thickness : Reynolds and Branson thickness tester.

In Fabric Thickness Gauge, the fabric whose thickness is to be determined is kept on a flat anvil and a circular pressure foot is pressed on to it from the top under a standard fixed load. Then the Dial Indicator directly gives the thickness in mm.

Fabric weight- Fabric weight is expressed as the weight of the fabric in grams per m2. It has no limits but does affect the many of the fabric properties.Fabric weight is a fundamental property that needs to be controlled during the manufacturing process in order to avoid economic loss, for example, by buying heavier fabric than is necessary for the product being manufactured. Fabric weight, that is, GSM, influences other fabric properties such as thickness, flexural rigidity, bending rigidity, drape, air permeability and thermal properties. For example, the lighter the fabric, the lower its bending rigidity.

This test can be carried out in different ways but it is very easy to know the weight of the fabric by cutting the fabric with the GSM cutter. Measure the GSM of the fabric by GSM cutter: .GSM means gram by square meter, and the weight of the textile which includes both knit, woven and non-woven is the designation, as the name implies. It’s a basic tool used to cut a tissue sample for the measurement of the gsm of the textile. The measurement of the fabric is 11.2 cm in diameter.

FABRIC STRENGTH-The strength of fabric or garment indicates its ability to resist mechanical damage due to the stress of normal wear and laundering. Fabric strength can be divided into three different areas i.e. resistance to tensile force, resistance to tearing force, and resistance to bursting force. In the case of woven fabric resistance to tensile force and tearing force is measured but in the case of knitted fabric resistance to bursting force is measured to assess the fabric strength.Bursting strength tester is used to determine fabric strength

FABRIC SHAPE-The dimensional stability of fabric refers to the change of fabric size when it is used or reprocessed due to the properties of a material and the potential thermal contraction force in the process of processing. The fabric with good dimensional stability is worn and washed for many times, the original pleating and shape are unchanged, and the dimensions don't shrink or elongated, which don't affect the user experience. The fabric with poor dimensional stability is usually shown as shrinkage, such as shrinkage in sewing, ironing, washing and so on. Among them, the wash shrink is the problem that consumer pays close attention to very much.

## 5. BASIC FABRIC PROPERTIES

1. COTTON

Appearance- When cotton is viewed under microscopic lens;

In longitudinal view, it appears as a flat tube with spiral twists or a twisted ribbon. Under cross section view, it is bean shaped.

Colour- Color of cotton fiber is instrumental in fiber identification. The usual color of cotton fiber ranges from white to creamy white. The color of fiber depends upon the conditions under which cotton is produced e.g., time of picking, soil of growth, exposure of plant to sunlight, climatic conditions, impact of insects and fungi etc. The cotton produced normally has a cream white color. If fiber is not picked at the right time, it color may vary. If fiber is left for an extended period of time in the boll, it may turn bluish- white.There are five recognized groups of color: white, gray, spotted, tinged, and yellow stained. As the color of cotton deteriorates the process ability of the fibers decreases.

Luster-Cotton fiber has a very low luster naturally just like low elasticity

Shape-The width of cotton fibre is fairly uniform, varying between 12 and 20 μm wide. The cross-section of cotton fibre is generally referred to as being kidney-shape and some are elliptical.

Fiber Strength-Fiber strength is measured in grams per denier (gm/den). Cotton is a moderately strong fiber. It has a tenacity of 3.0 - 4.9 gm/den. The strength of cotton fiber is directly affected with the moisture regain and higher length. Wet cotton fiber is 20% stronger than dry cotton fiber. Similarly, long cotton fibers are stronger than short fibers.

Flexibility- Easy to fold and less flexible

Elastic Property-Elasticity of cotton fiber is very low. Recovery from deformation of cotton fiber from applied load is very low as cotton fiber is a rigid fiber and inelastic. At 2% extension, it has elastic recovery (ER) of 74%. At 5% extension, it has elastic recovery (ER) of 45%. Elastic property can be achieved by Chemical treatments for the purpose of improvement in crease recovery but fibers become harsher due to chemical treatment.Blending or mixing of cotton with elastic fiber, e.g. polyester.

Absorbancy-Cotton fiber has high absorbency power and this is why this fiber can be died properly and without any problem or difficulty. It absorbs perspiration

quickly which is its highly esteemed property. As the body perspires, cotton fibers absorb the moisture and release it on the surface of the fabric, so it evaporates.

Electrical Conductivity- Cotton is a very good conductor of heat and air. Cotton is a good conductorof electricity.

Dimensional stability-good

Effect of heat-Decomposes after prolonged exposure to temperatures of 150˚C or over.Burns readily.

Drapeability-The drape-ability of cotton fiber is quite good. You can use the cotton fiber made fabric in any kind of wear which needs more flexibility and drapes.

Stiffness- moderate to good

2. RAYON

Appearance - Striations seen in viscose and high-strength rayon

– If DE lustered, scattered specks of pigment can be seen.

Colour -white

Luster -Light to bright.High unless DE lustering pigment added

Shape-Manmade fibres can be manufactored in any length and diameters. In cross section the viscose rayon fibres appears as irregular circles with srerated (having a toothed edge) edges

Flexibility- moderate to good

Fibre Strength-Fair to excellent

– Regular rayon has fair strength

– High tenacity types have well to excellent strength

Elasticity- Regular rayon is low

– High strength rayon is good

Absorbancy-Regular rayon is low

– High strength rayon is good

Electrical conductivity- when viscose rayon quite dry, it is a good insulator but the moisture that it inevitably picks up considerably reduces its value for electrical uses. Viscose is not so liable to develop static charges in textile working as is cellulose acetate.

Dimension stability-It changes shape /dimension with abrasion and washings.

Effect of Heat-Loses strength above 300′ F

Decomposes between 350 and 400′ F

Drapeability- It drapes beautifully and is one of the most preferred wedding dress materials

Stiffness-poor

3. WOOL

Appearance - It is characterized by crimp and scales. Due to crimp, it is bulkier and wormer. Due to scale, it has differential friction which is not present in cotton. Due to scales and extensibility, its feeling property is good. Color varies depending n the types of wool.

Colour -The colour of wool fibre could be white,near white,brown and black.

Luster - Luster of course fibre is higher than fine fibre

Shape-The length of wool fiber varies from 2 inches to twelve-inch depending on the type of fiber and the interval length of time of collec

Flexibility- good flexibility

Fibre Strength-It is stronger than silk. When wet wool loses about 25% of its strength. Longer the fibre the greater will be the strength of the yarn.Wool is a weak fiber. Its tenacity varies from 1 to 15 g/dtex but very high extension at break which is 35%.

Elasticity- natural elasticity helps wool garments stretch with your body, yet return to their original shape. So fine wool clothing is ideal to wear when exercising.

Absorbancy- Wool is the most hygroscopic in nature. It can absorb up to 50% of its weight and carry up to 20% weight, without giving the feeling of being wet. Upon drying it losses moisture slowly preventing rapid evaporation thus avoiding chilling feel to the user. It absorbs perspiration after violent exercise and guards the body against the sudden change in temperature.

Electrical conductivity- Wool fiber is not a good conductor; therefore, the apparel or clothing made from these are considered to be the best for winter wear.

Dimension stability-poor to good

Effect of Heat- Low heat has no effect but strong heat weakens the fibre and destroys the colour of the fibre.

Drapeability-poor

Stiffness-Wool fibres are extremely fine, enabling them to bend and feel soft and gentle next to your skin.

4. SILK

Appearance - Cultivated degummed silk viewed lengthwise underneath a microscopic, resembles a swish clear rod underneath magnifier. Silk within the gum has rough irregular surface. Wild silk tend to be quite uneven and is a few what dark. it's going to have longitudinal striations.Single, smooth, nearly Triangular cross-section structureless, occasion- with rounded comers. with flattened fibre, variable in diameter. Degummed silk Flat irregular ribbons Very enlongated triangles separate,

Colour -The color of silk fiber could be yellow, brown, green or grey.

Luster - Bright.

Shape- Silk filaments square measure terribly fine and long. they regularly live regarding one thousand to 1300 yards long. The breadth of the silk is from nine to eleven microns.

Flexibility- poor to good

Fibre Strength- Cotton is a strong fiber. It has a tenacity of 3.5 - 5 gm/den. The strength is greatly affected by moisture; the wet strength of silk is 75 - 85%, which is higher than dry strength.

Elasticity- Not so good. it's associate elastic fibre and its physical property varies because it is fibre. Silk fibre could also be stretched from 1/7 to 1/5 its original length before breaking.

Absorbancy- Standard moisture regain is 11% but can absorb up to 35%.t has more absorbency than cotton. The moisture regain of silk is 11%. It absorbs moisture more quickly than cotton but it gets dried fairly quickly too.

Electrical conductivity- The silk is a poor conductor of electricity. it has a tendency to form static charge, when it is handled during different kinds of processes like weaving etc. This causes difficulties during processing in dry atmosphere.

Dimension stability-

Effect of Heat- Silk will withstand at higher temperatures than wool. It will remain unaffected for prolonged periods at 1400C. Silk decomposes at 1750C.

Drapeability- Silk fibre sows good flexibility. The silk fabric poses good drapping properties.

NYLON

Appearance -Very smooth and even

Colour - white

Luster - Bright to Light.High natural luster can be controlled

Shape Flexibility-
poor
Fibre Strength- Exceptionally high (60,000 – 108,000) pounds per square inch

Elasticity- Very good

Absorbancy- poor

Electrical conductivity- Low, generates static

Dimension stability-good

Effect of Heat- High resistance melts at 482′ F

Drapeability-poor
Stiffness- good

Color Fastness:

Color fastness is one of the important factors in case of buyers demand. The outstandingly important property of a dyed material is the fastness of the shade of color. Color fastness refers to the resistance of color to fade or bleed of a dyed or printed textile materials to various types of influences e.g. water, light, rubbing, washing, perspiration etc. to which they are normally exposed in textile manufacturing and in daily use. We have written a lot of articles on color fastness.

Factors Affecting the Color Fastness Properties:

1. The chemical nature of the fiber. For example, cellulosic fibers dyed with reactive or vat dyes will show good fastness properties. Protein fibers dyed with acid mordant and reactive dyes will achieve good fastness properties and so on. That is to say compatibility of dye with the fiber is very important.
2. The molecular structure (e.g.) of a dye molecule: If the dye molecule is larger in size, it will be tightly entrapped inside the inter-polymer chain space of a fiber. Thus the fastness will be better.
3. The manner in which the dye is bonded to the fiber or the physical form present.
4. The amount of dye present in the fiber i.e. depth of shade. A deep shade will be less fast than a pale or light shade.
5. The presence of other chemicals in the material.
6. The actual conditions prevailing during exposure.

You Can Read the Following Articles:

- Color fastness to washing
- Color fastness to water
- Color fastness to rubbing/crocking

- Color fastness to perspiration
- Color fastness to light
- Color fastness to sea water
- Color fastness to chlorinated water
- Color fastness to hot pressing

Color fastness to washing The resistance of a material to change in any of its color characteristics, when subjected to washing is called color fasntess to washing.

General Principle:
A specimen of the textile to be tested, with the adjacent fabric attached is subjected to washing under specified conditions. Te extent of any change in color and that of the staining of the adjacent fabric are assessed and the rating is expressed in fastness numbers.

There are two types of adjacent fabrics; (1) single fiber fabric and multiple fiber fabric. In the case of multi fiber fabric only one specimen is required and in the of single fiber fabric two adjacent fabric are required.
There are various colorfastness tests. Details of washing fastness tests are given below.
Fastness to Washing:
In the test, change in color of the textile and also staining of color on the adjacent fabric are assessed. A 10 x 4 cm swatch of the coloured fabric is taken and is sandwiched between two adjacent fabric and stitched, The sample and the adjacent fabric are washed together. Five different types of washing are specified as different washing methods.

Fig: Washing fastness testing by Gyrowash

.

Fastness to Wash

| Sr.No | Method | Washing severity | Soap+Soda in grams/liter | Time in minutes | Temperature | Steel balls |
|---|---|---|---|---|---|---|
| 1 | IS:687:79 | Very mild like hand wash | 5 | 30 | 40+/- 2 | Nil |
| 2 | IS:3361:79 | 5 times severe than method 1 | 5 | 45 | 50+/- 2 | Nil |
| 3 | IS:764:79 | Mild washing | 5 + 2 | 30 | 60+/-2 | Nil |
| 4 | IS:765:79 | Severe washing | 5 + 2 | 30 | 95+/-2 | 10 |
| 5 | IS:3417:79 | Severe washing | 5 + 2 | 4 hrs | 95+/-2 | 10 |

The solution for washing should be prepared to the required temperature of washing. The liquor material ratio is 50:1 . After soaping treatment, remove the specimen, rinse twice in cold water and then in running cold water under a tap. Squeeze it and air dry at a temperature not exceeding 60°C. The change in color and staining is evaluated with the help of grey scales.

Color fastness to rubbing/crocking

A fastness is a place, such as a castle, which is considered safe because it is difficult to reach or easy to defend against attack. This test is designed to determine the degree of color which may be transferred from the surface of a colored fabric to a specify test cloth for rubbing (which could be dry and Wet).

There are two test methods for rubbing fastness.

1. ISO-105-X12
2. AATCC-08

In ISO-105-X12 the wet pickup of the rubbing cloth is 100% .While in AATCC-08 the wet Pickup of the rubbing cloth is 65%.We check rubbing by Dry and Wet methods. In wet rubbing we wet the rubbing cloth according to test method and give rating by comparing the Staining with the gray scale.

Similarly for dry rubbing we check the rubbing with dry rubbing cloth and compare the staining With gray scale for ratings.Color Fastness to rubbing is a main test which is always required for every colored fabric either it is Printed or dyed.

If the color fastness to rubbing is good then its other properties like Washing fastness and durability etc improves automatically because the rubbing is a method to check the fixation of the color on the fabric. So if the fixation is good its washing properties will be good.

Rubbing Fastness depends on:

- Nature of the Color
- Depth of the Shade

Construction of the FabricNature of the color Each color either it is pigment ,Reactive ,Disperse or direct has its own fastness properties to rubbing. There are

some colors like black, Red ,Burgundy ,Navy blue which have poor Color fastness properties because of their chemical structure.
Like Black color is a carbon base color and the particle size of carbon is large than the other colors that's why its rubbing properties are poor. Similarly red and blue are in the same case. So to improve the color fastness we add more binder to improve the fastness properties of these colors. It doesn't mean that we can not achieve the best results with these colors. The required results can achieve but production cost will be increase. On the other hand the construction of the fabric also effects the fastness properties.

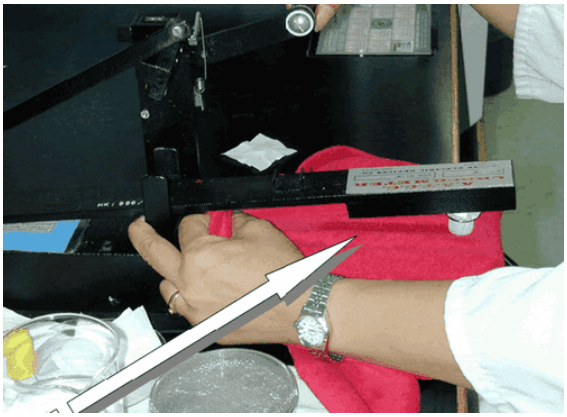


Fig: Rubbing fastness test

If the rubbing fastness on 100.80/40.40 is 3 on the gray scale it will be 2-3 on 52.52/22.22 with the same printing parameters. So always keep in mind these effects during finalize the required parameters with your customer .

Color Fastness Test to Light Fastness

The purpose of Color fastness to light test is to determine how much the color will fade when exposed to a known light source. It is an off line quality assurance system. Generally man wears the fabric and goes outside of the home for doing their job. In day; sun light fall on the fabric surface. So it needs to know how much protection ability have a fabric to sun light. It is determined by an experiment called color fastness to light. To measure the color fastness a blue scale is used. After completing the test, sample is compared with the blue scale.

Principle of Color Fastness to Light:

This test measures the resistance to fading of dyed textile when exposed to day light. The test sample is exposed to light for a certain time which is about 24 hours to 72 hours or by customer/buyer demand and compare the change with original unexposed sample the changes are assessed by Blue Scales.

Light Fastness Grades:

| Grade | Degree of Fading | Light Fastness Type |
|---|---|---|
| 8 | No fading | Outstanding |
| 7 | Very slight fading | Excellent |
| 6 | Slight fading | Very good |
| 5 | Moderate fading | Good |
| 4 | Appreciable fading | Moderate |
| 3 | Significant fading | Fair |
| 2 | Extensive fading | Poor |
| 1 | Very extensive fading | Very poor |

Color Fastness to Light with the Microsol light Fastness Tester:

The testing is done step by step. Following step is maintained during measure the color fatness to light.

- Cut the four pieces of test specimens according to the length & width wise and attached with the specimen holder.
- Then the holder set in to the Microsol light fastness tester.
- Then the experiment continued at 72 hours according to the buyer's requirement.
- After 72 hours later the specimen taken from the light fastness tester
- Then the test specimen compare with the Blue scale or computer color matching system (CCMS).

Unit 2: Weaves and Fabric Construction

A loom is a device used to weave cloth and tapestry. The basic purpose of any loom is to hold the warp threads under tension to facilitate the interweaving of the weft threads. The precise shape of the loom and its mechanics may vary, but the basic function is the same

Definition Of Loom

Loom is a machine or device which is used to produce woven fabric by interlacement of warp and weft yarn. Ginning, opening, cleaning, carding, combing, drawing, spinning, winding, warping, sizing, beaming are the process prior to weaving. All these process converge on loom.

Classification Of Loom

a) Hand loom.

b) Powerloom.

Handloom refers to wooden frames of different types which are used by skilled artisans to weave fabrics usually from natural fibers like Cotton, Silk, Wool, Jute etc. ..

Hand Loom

1. Primitive or power loom.
2. Pit loom.
    i. Through shuttle loom.
    ii. Fly shuttle loom.
3. Frame loom:
    i. Through shuttle.
    ii. Fly shuttle.
4. Chittranjan loom.
5. Hattersleyloom.

Power Loom

A powerloom is a type of mechanically powered loom driven by a steam engine or electric power used to weave cloth.

1. Conventional power loom:
   i. Simple.
   ii. Automatic.
2. Modern loom:
   i. Jet loom.
   ii. Rapier loom.
   iii. Multiphase loom.

Jet loom:

a. Air jet loom.
b. Water jet loom.

Rapier loom:

a. Single.
b. Double.

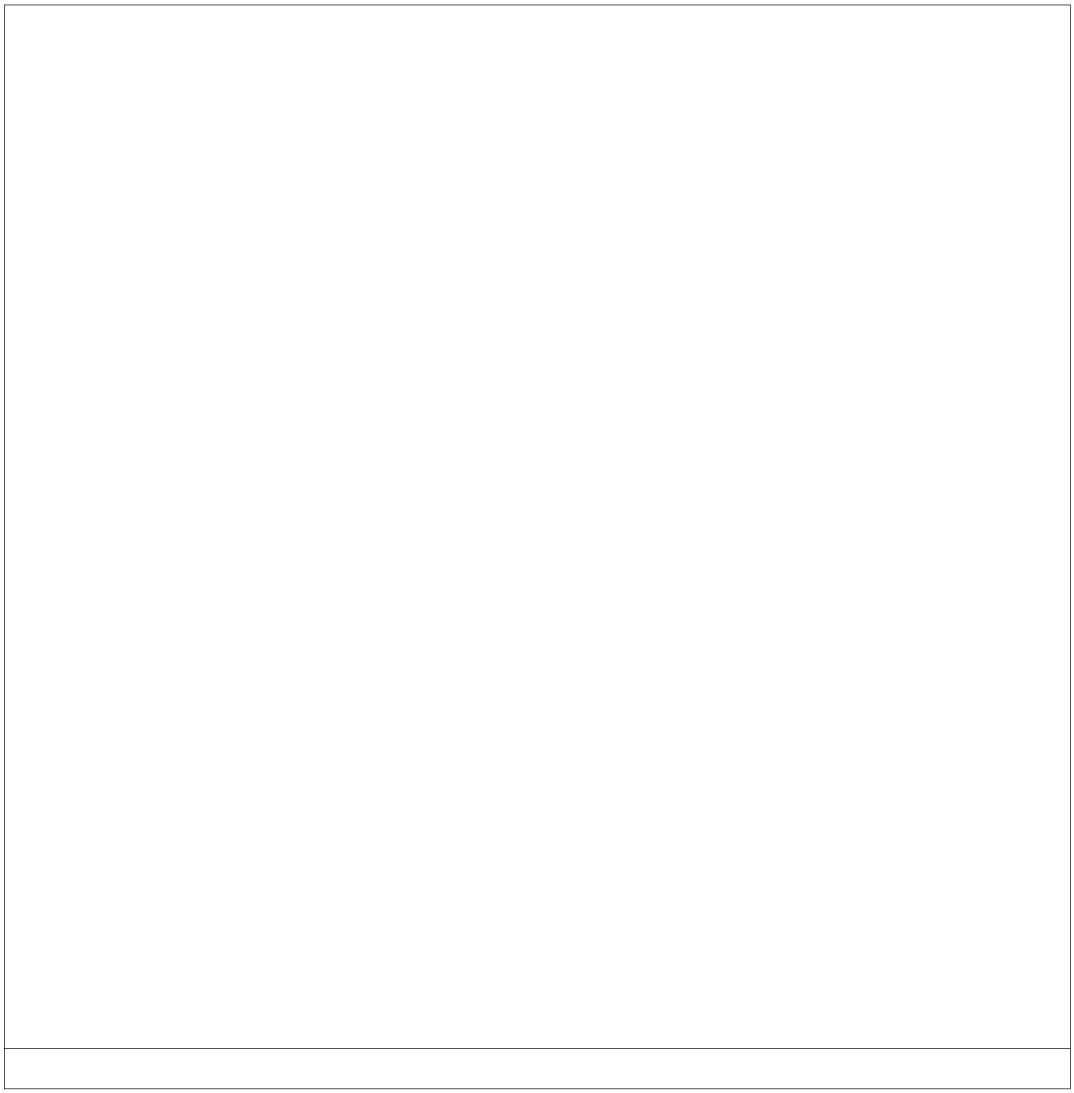
Multiphase loom:

a. Plain.
b. Circular.

Basic Parts of a Loom

Clothes are second basic need of human being. people make clothes by using a method which interlacing the different types of yarns together. This process is popularly known as 'weaving'. Textile weaving is as old as our civilization. Weaving is practised all over the globe. Looms are the most well known word to the people in terms of weaving. The main function of the loom is to weave clothes. For enhancing the working capabilities, the size and shape of the looms may vary but the basic structure of all types of looms are same. There are many available in this era. Some of them are:

- Back strap loom
- Warp weighted loom
- Draw loom
- Handloom
- Haute lisse loom
- Power loom etc.



Basic Parts of a Loom

Basic Parts of a Loom

Heald Shaft-This part is related to the shedding mechanism. In textile weaving industry, heald shaft is produced by using metal such as aluminium or wood. It carries a number of heald wires through which the ends of the warp sheet pass. The heald shafts are also termed as 'heald staves' or 'healdframes'. The total no. of heald shafts varies according to the warp repeat of the weave. It is decided by the drafting plan of a weave during weaving.

Functions of Heald Shaft in Weaving:

- Heald shaft helps in weaving shed formation.
- It also maintains the sequence or order of the warp threads.
- Heald shaft determines the warp thread density in a fabric, i.e. the numbers of heald wires per inch determine the warp thread density per inch.
- It apprehends the order of lowering or lifting the necessary no. of healds for a pick. It

  helps in forming the design or pattern in a fabric.
- Heald shaft is useful in identifying broken warp threads in weaving.

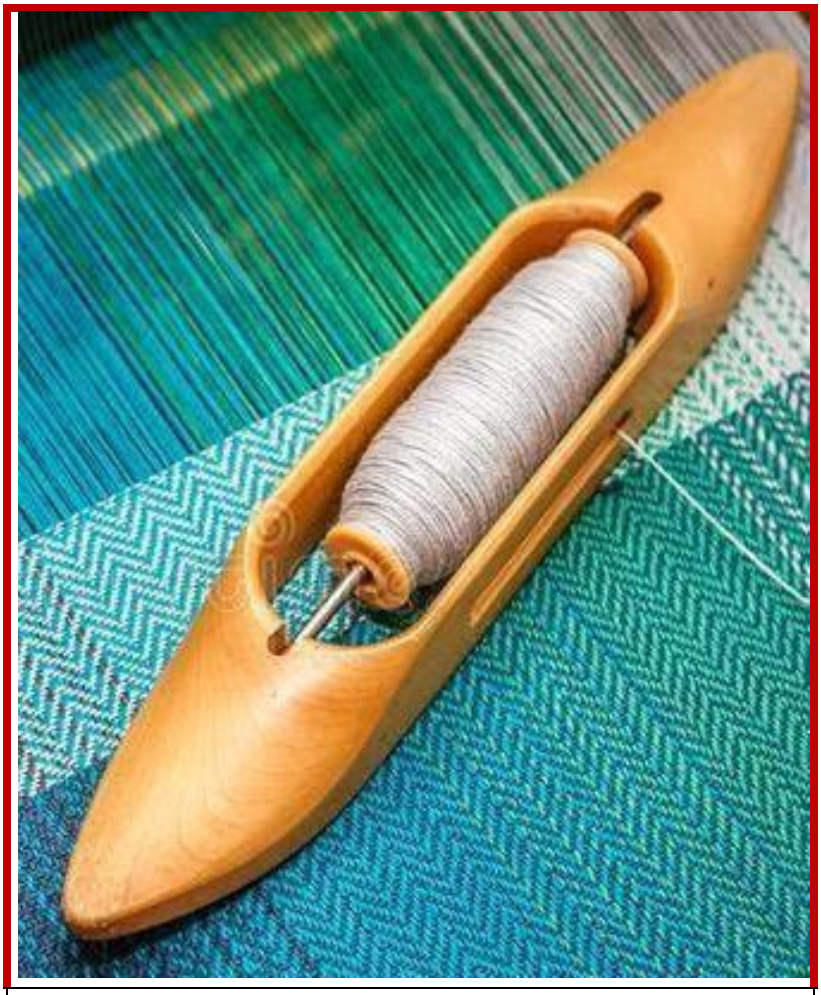
Sley of Lay: It is made of wood and consists of the sley race board or sley race, reed cap and metal swords carried at either ends. The sley mechanism swings to and fro.

Functions of Sley of Lay:

- Sley is responsible for pushing the last pick of weft to the fell of the cloth by means ofthe beat up motion during.
- When moving towards the fell of the cloth the sley moves faster and moves slower when moving backwards. This unequal movement is termed as 'eccentricity of the sley'.

- In order to perform the beat up and also to give sufficient time for passage of shuttle to pass through the warp shed sley is needed in weaving.

Shuttle: In textile weaving, shuttle is a weft carrier and helps in interlacement of the weft with thewarp threads to form fabric.



Shuttle in weaving loom

Functions of Shuttle:

- The shuttle is made of wood which passes from one end of the loom to the other.

- Shuttle travels along the wooden sley race and passes between the top and bottomlayers of the warp sheet.
- After passing through the warp shed, shuttle enters a shuttle box fitted at either ends of the loom. It should be noted here that, a shuttle normally weighs about 0.45kgs.

Functions of Shuttle Box:

Shuttle box is the housing for the shuttle and is made of wood. It has a picker and a spindle. It may also accommodate the picker without spindle. The top and side of the shuttle box unto the sley race are open. The shuttle dwells inside the box for the intermediate period between two successive picks.

- Reed:

Reed is a metallic comb which is fixed to the sley with a reed cap. In textile, shuttle is made of a no. of wires and the gap between wires is termed as dents. The count of the reed is decided by the no. of dents in two inches. There are different types of reed in textile weaving such as ordinary reed, expanding reed, gauze reed, V reed etc.

## REED

Functions of Reed:

- Reed pushes the lastly laid pick of weft to the cloth fell.
- It determines the fineness of the cloth in conjunction with the healds.
- Reed acts as a guide to the shuttle which passes from one end of the loom to the other.
- It helps to maintain the position of the warp threads.

- Reed determines the openness or closeness of the fabric.

- Picker:

  Picker is a piece made either of synthetic material or leather. Picker may be placed on a grooves or spindle in the shuttle box. Picker is used to drive the shuttle from one box to another. While entering the box it also sustains the force of the shuttle.

- Warp Beam:

  Warp beam is also known as the weaver's beam. It is fixed at the back of the loom. The warp sheet is wounded on to the warp beam. The length of warp in the beam may be more than a thousand meters.

Functions of Back Beam:

Back Beam is also known as the back rest. It is placed above the weaver's beam. Back Beam may be of the floating or fixed type. The back rest merely acts as a guide to the warp sheet coming from the weaver's beam in the first case. Back beam acts both as a sensor and as a guide for sensing the warp tension in the second case.

- Breast Beam:

Breast beam is also termed as the front rest. At the front of the loom, it is placed above the cloth roller and acts as a guide for the cloth being wound on to the cloth roller. It maintains proper tension to facilitate weaving.

- Cloth Beam:

Cloth beam is also called as the cloth roller. The woven fabric is wounded on to this roller. Cloth beam roller is placed below the front rest. It is also termed as the cloth roller.
The woven fabric is wounded on to this roller. This roller is placed below the front rest.

WEAVING PROCESS

As defined earlier, the weaving process requires interlacing of warp and weft yarns at right angle to each other. In order to interlace these yarns, basic mechanism involves primary and secondary motions. The primary motion includes shedding, picking, and beat-up, whereas the secondary motions are warp let-off and cloth take-up.

Primary Motions:

The motions that are compulsory for weaving process are called primary motions. Weaving will not happen if any of these motions are not completed. These motions include

- Shedding
- Picking
- beat-up.

- Shedding:

This is a process of raising and lowering warp yarns by harnesses to make an opening for the filling (weft) yarn to pass through. In shedding motion, warp threads are divided into two layers. The top layer is called top shed line, and the bottom layer is called bottom shed line. The raised and lowered form of warp yarns is called shed, and there are three types of shedding motions available for different types of fabrics, namely tappet shedding, dobby shedding, and jacquard shedding. The shedding is achieved by means of treadles, dobby, or jacquard. The treadles are used in handlooms, operated by the weaver's feet, and in power looms, operated by shedding tappets. The dobby and jacquard are either mechanically controlled or electrically controlled shedding systems. Healds are used in tappet and dobby shedding systems, whereas jacquard controls the warp threads individually for producing sheds by means of hooks, needles, harness cord, and knives. A simple shedding motion controlled by harness is shown in Figure-3. On the basis of shed geometry, the shedding is broadly divided into two classes: closed shedding and open shedding.

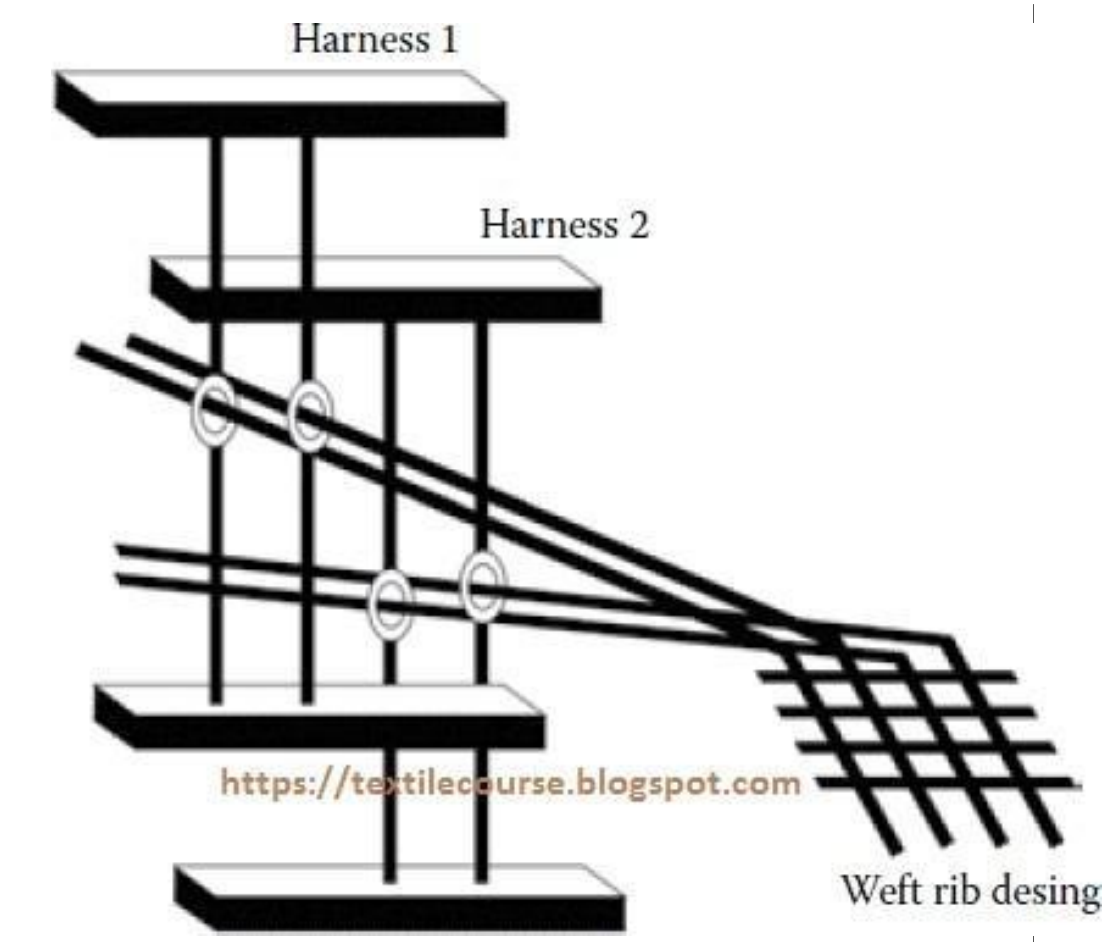



Figure-3: Shedding motion

Closed shedding:

The closed shedding system employs all of the warp yarn levels after the insertion of each pick. The level is made either at bottom/top or at the centre of shed line. The type of closed shed where the level of warp yarns is made at bottom/top shed line is called bottom closed shed or top closed shed depending on the position of levelling. This kind of shed is produced by giving motion only to threads that are to form the upper shed line. Similarly, the type of shed where warp yarns are made level at the centre shed line is called centre closed shed. In centre closed shed, the warp yarns required to make the top shed line are

made to move upward, whereas the warp yarns required to make the bottom shed line are made to move downward. Afterward, all the warp yarns meet at the centre shed line. The schematic diagrams of bottom closed shed and centre closed shed are shown in Figure-4. The advantage of bottom closed shed is to achieve high cover factor at the cost of high power consumption and wear and tear of weaving parts. The bottom/top closed shed is not suitable for high-speed weaving due to larger time required for changing the shed. The high-speed weaving can be achieved by centre closed shed due to less strain in warp yarns as compared to bottom/top closed shed. The power consumption and wear and tear are also less in center closed shed as compared to bottom/top closed shed.

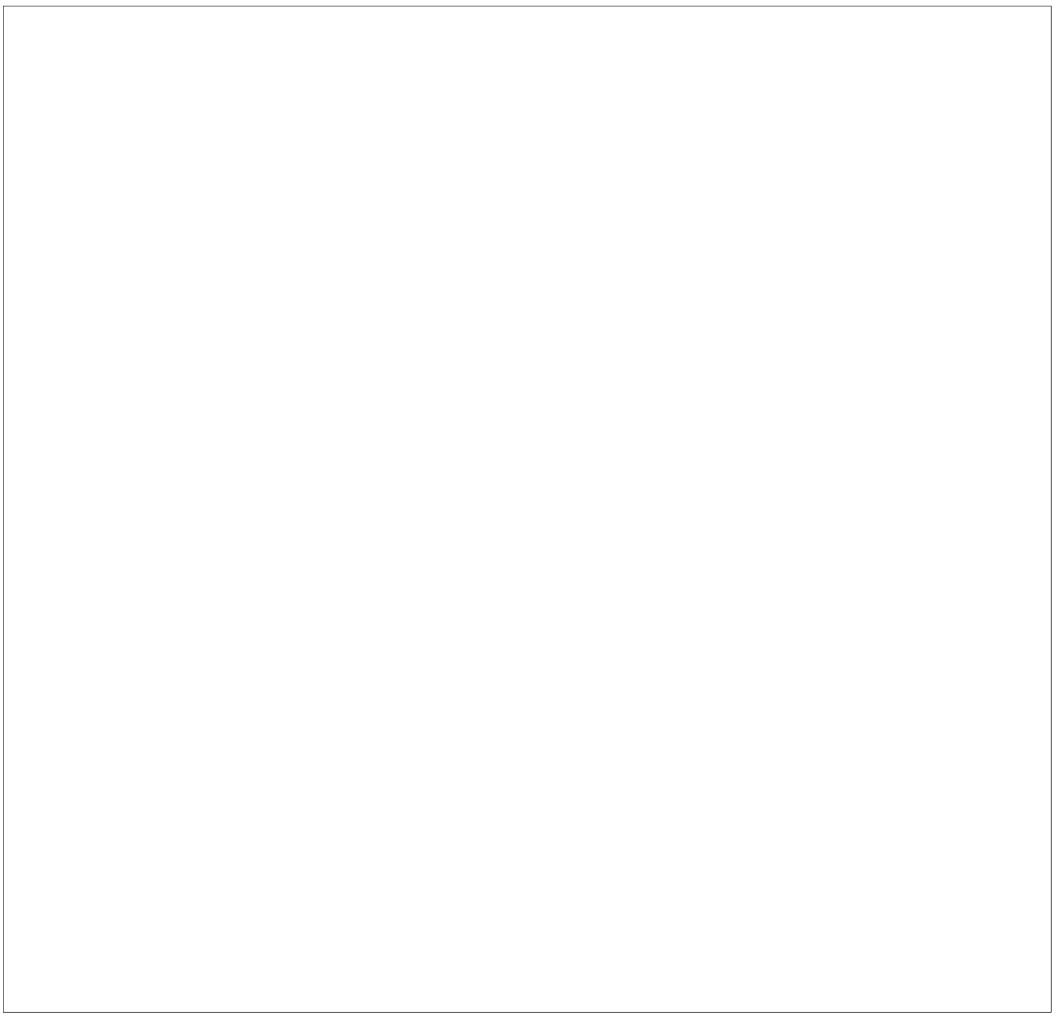


Figure-4: Semi-open, centre closed, bottom closed, and open

Open shedding:

In open shedding, the warp is only moved when a pattern requires a change of position. There are two methods of producing open shedding, that is, open shedding and semi-open shedding. In semi-open shedding, as shown in Figure-4, the stationary bottom line is retained, but warp yarns of the top shed line is either lowered to the bottom at one movement or raised to the top. The remaining warp yarns move down. This is formed under both open and closed principles and is being used by double-lift dobby and Jacquard shedding system.

In open type of shedding, as shown in Figure-4, the warp threads form two stationary lines, one at the top and the other at the bottom. After inserting a pick, threads are moved from one fixed line to the other. So, one line of thread is lowered from the top to the bottom, and the other line was raised from the bottom to the top simultaneously. Open shedding is performedusing ordinary tappets.

- Picking:

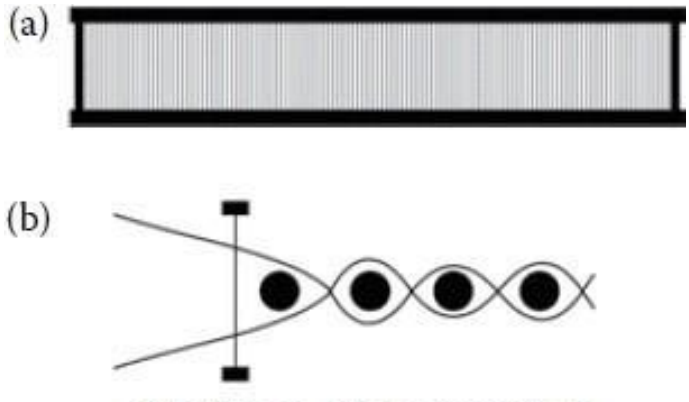
The insertion of weft yarn through shed is called picking. Mostly, the weaving machines are categorized based on their picking systems. There are two major types of available picking systems, namely shuttle and shuttle less picking. Shuttle picking is further categorized into two main systems, that is, under picking and over picking. In under picking, the picking sticks moves under the shuttle box, whereas in over picking, the picking stick moves over theshuttle box.

In shuttle less picking system, the picking is carried out with the help of various picking media such as projectile, rapier, air, and water. Shuttle less picking system has an advantage of high speed over shuttle picking system. A number of weft (filling) selections are made available on weaving loom to select the desired weft depending on the count and colour of weft yarn. A weft, being inserted through a shed, is shown in Figure-5.

- Beat-Up:

The filling insertion system cannot fit the weft at an acute angle of shed opening, which is done with the help of beat-up motion. The fitting of newly inserted pick to the fell of cloth is called beat-up. The fell of cloth is an imaginary line which shows the point of cloth woven. The beat-up

is performed with the help of a device called reed. The reed acts like a comb made of metal stripes. A typical reed is shown in Figure-6.




Beating up on an open shed



Beating up on a closed shed

Figure-5:
Picking

Figure-6: (a) A reed used for beat-up, (b) beat-up for an open and closed shed.

Secondary Motions:

The weaving motions required to make the weaving process continuous are called secondarymotions. These motions include

- warp let-off motion
- cloth take-up motions

- Warp let-off motion:

As the fabric is produced, it is required to let off the warp yarn for continuous weaving. The delivery of warp yarn at required speed is called warp let-off motion. The warp yarns are delivered in the form of

sheet from weaver beam installed at the back of loom. The let-off motion has been controlled by dead weight called lingos, but nowadays the speed of this motion is controlled using load cell and servo motor. An electrically controlled warp let-off motion is shown in Figure-7. As the cloth is woven, the warp yarns exert a tension on whip roller. The whip roller moves forward toward the front side of loom and does an amount of work against the force of spring. The work done in terms of displacement is measured by a sensor, which gives signal to control panel. The control panel sends instruction to servo motor to adjust the speed in order to let off the warp sheet.

- Cloth take-up:

The woven cloth needs to be wound on a specific package after it has been beaten up. The winding of woven cloth is called take-up. The cloth is wound on a roller, which is placed on the front side of loom, called the take-up roller. The take-up motion defines the pick density of woven cloth. It is important to note here that take-up of cloth is always less than the length of warp sheet due to warp shrinkage. Modern cloth take-up systems are electrically controlled by servomotor as shown in Figure-8. The take-up roller is connected to servo motors via pairs of worm and worm wheel. The take-up system is equipped with electrical sensor to control the surface speed of take-up roller to provide the required number of picks per unit length.

Auxiliary Motions:

These mechanisms are useful to produce defect-free woven fabric production. Weaving machine is the complex machine. It is difficult to monitor all the points like yarn breaks, finish of weft yarn, etc. Without these tertiary motions, the process will continue, but it is

quite impossible to make a defect-free cloth. Hundreds of yarns are running in a loom, so it is quite impossible to monitor all the yarns separately. It may cause the faulty production.

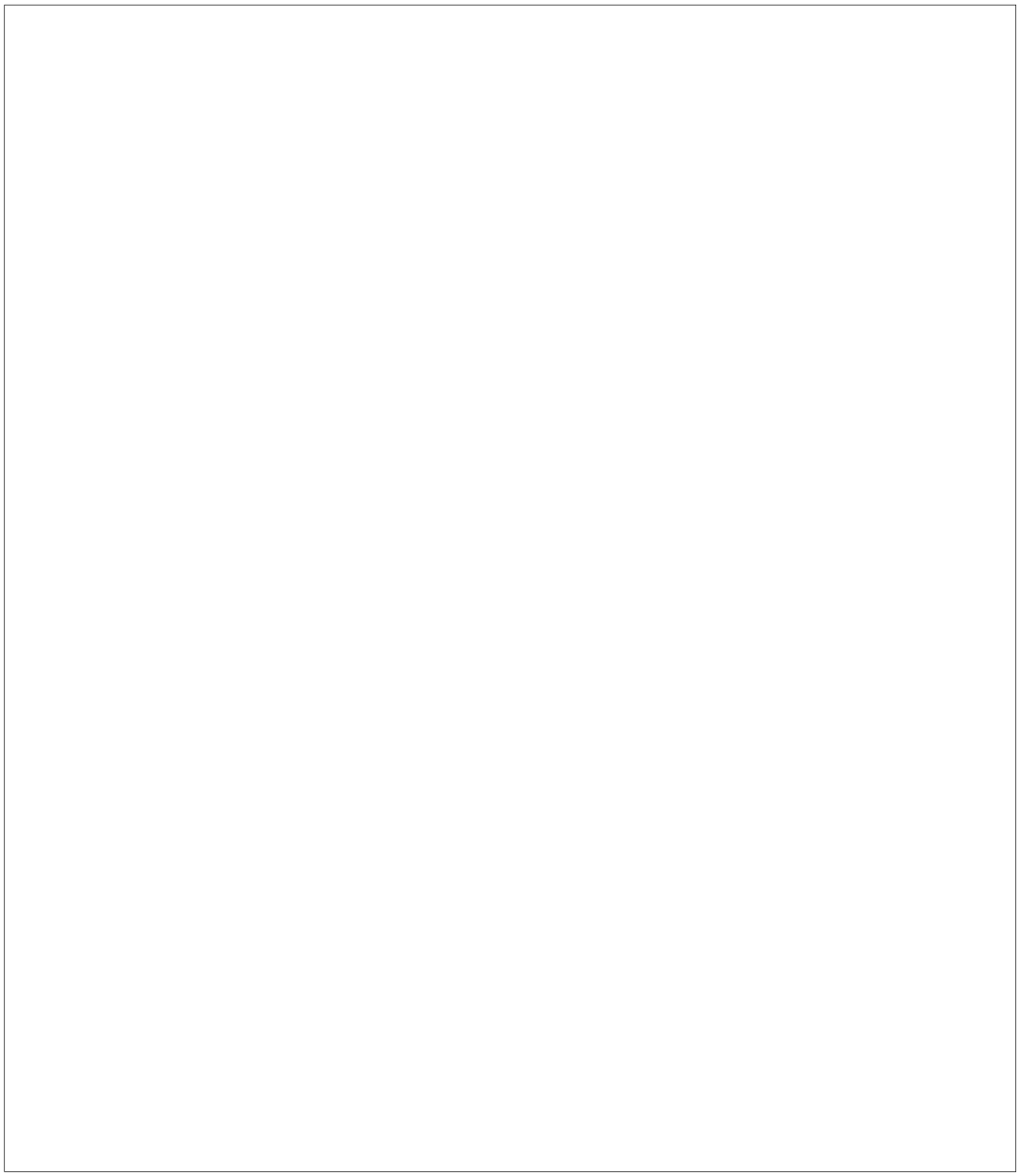
Warp stop motion:

Warp stop motion stops the loom at the event of warp yarn breakage. The motion helps to remove the faults which are expected to be produced due to warp yarn breakage. All the warp yarns are required to pass through an individual special inclined shape wire, which is called dropper. The length of dropper ranges from 120 to 180 mm, while the width of dropper is usually found as 11 mm. In the event of warp breakage, the dropper wire falls on dropper rod. The dropper rod is composed of positive and negative terminals. After the falling of dropper wire, the electrical circuit of the dropper rod is completed. The completion of electrical circuit sends the instruction to servo motor to stop via control panel.

Weft stop motion:

Weft stop motion has been used to stop the loom at the event of weft breakage. In modern looms, mainly two types of weft stop motions are used, namely piezoelectric electronic weft stop sensor and optical sensors. The optical type of weft stop sensors is shown in Figure-7. The piezoelectronic weft stop sensor is designed for rapier and projectile looms, whereas the optical sensors are made especially for air-jet looms. The piezoelectronic sensor is made of smart materials, which works on the principle that vibration produces electric charges. The electric charges produced are used to send the signal to stop loom. Under normal running of loom, the electric charges are produced with low amplitude due to less vibration; however, when the weft yarn is broken, a jerk is produced which results in high amplitude of electric

charges. These high-amplitude electric charges are used to stop the loom. On the other hand, the optical sensor detects the light emitted by a light source. In air-jet looms, optical weft stop motion sensor serves two purposes, that is, stops the loom if weft yarn is broken and stops the loom if weft yarn has been moved too forward. The sensors are classified as Weft Feeler 1 and Weft Feeler 2. Weft Feeler 1 senses the absence of weft yarn and stops the loom, whereas Weft Feeler 2 senses the presence of yarn and stops the loom.



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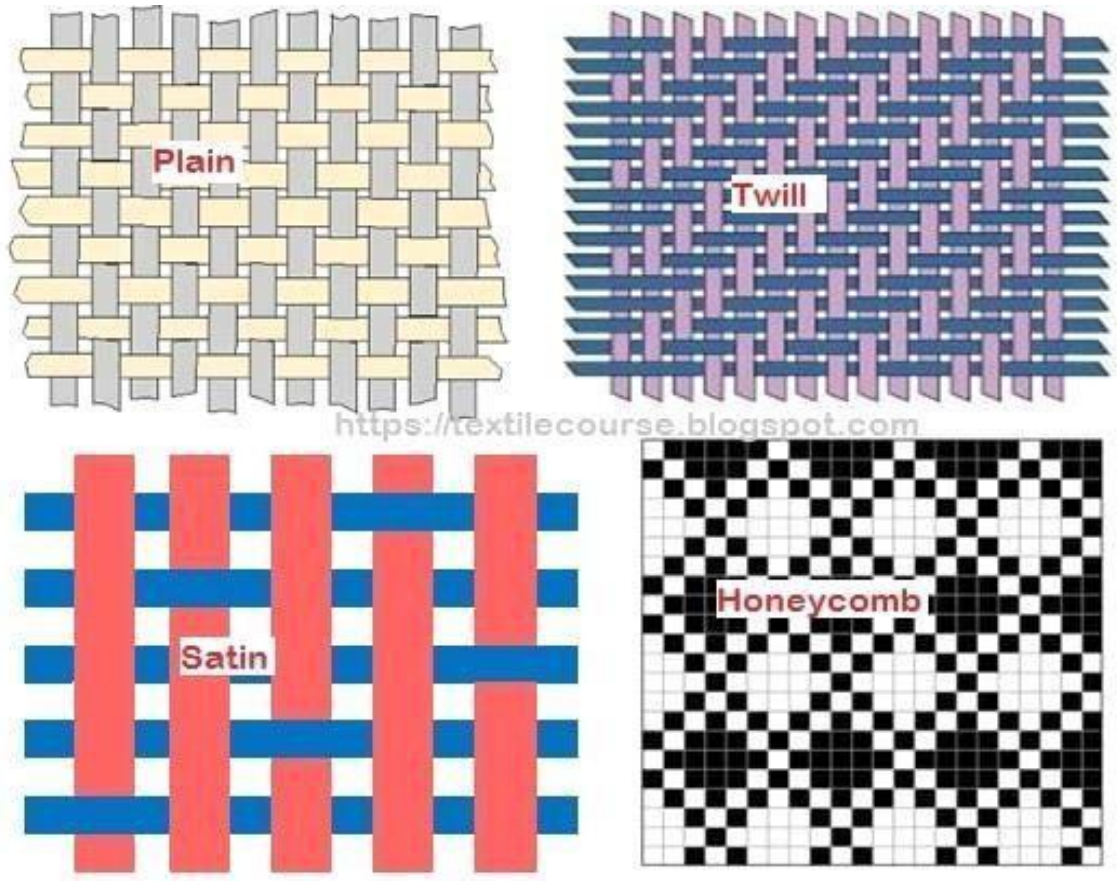
igure-7 :

Other auxiliary motions are warp tension compensation motion, weft tension control motion, auto pick finding motion, weft mixing motion, weft holding, tucking and trimming motion, warp protector motion, weft replenishment motion, and temple motion.

Basic Weaves

Weave is the interlacing pattern warp and weft yarns, in order to produce a woven fabric. Weave structures is the design by which fabric is produced. Fabric are manufactured in wide varieties and design. The great variety of weaves found in the textiles of today are modifications of a few fundamental weaves invented in the earliest times. The basic weaves are plain, twill, and satin. All the others are derivatives of these basic weaves or their combination. In this article I will discuss about different types of basic weaves structures and their names.



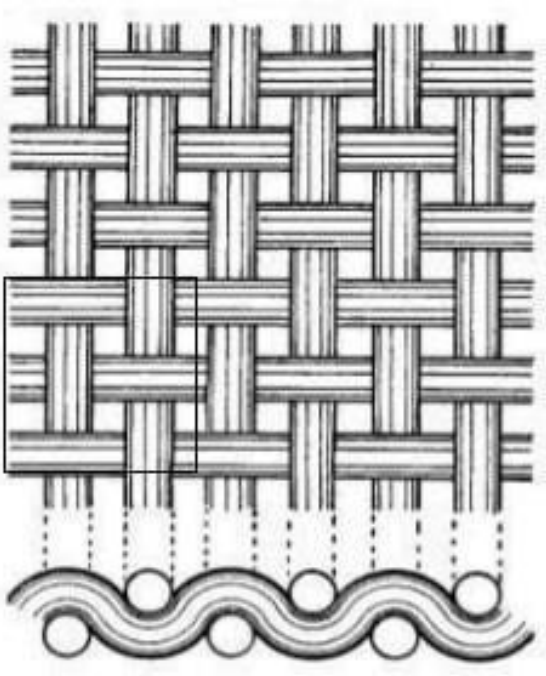
Different Types Of Weaves and Their Names:

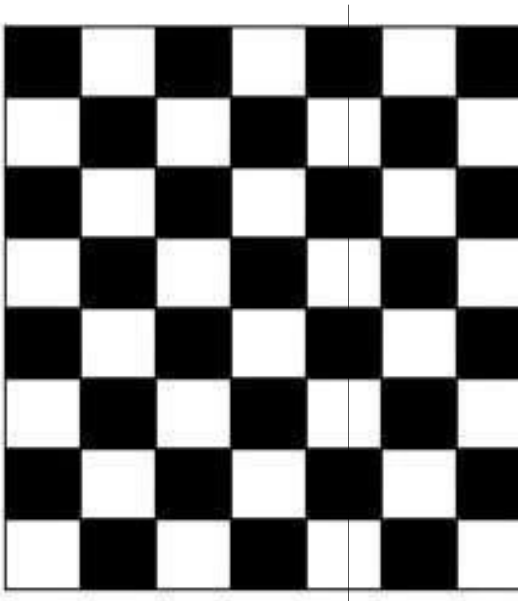
- Plain Weave
- Twill Weave
- Satin/Sateen
- Honey Comb Weave
- Huck a Back Weave
- Crepe Weave
- Bedford Cord Weave
- Welts and Pique
- Mock Leno Weave

All types of basic weaves are descried briefly.

Plain Weave:

Plain is the simplest weave, in which warp and weft threads interlace in alternate manner (as shown in Figure-2), giving maximum number of interlacements. This maximum interlacement imparts firmness and stability to the structure. In trade, the special names like broadcloth, taffeta, shantung, poplin, calico, tabby, and alpaca are applied to plain weave. At least two ends and two picks are required to weave its basic unit. A minimum of two heald
frames are required for this weave, but more than two (multiple of basic weave) heald frames can be used to weave this construction. It is used in cambric, muslin, blanket, canvas, dhothi, saree, shirting, suiting, etc.





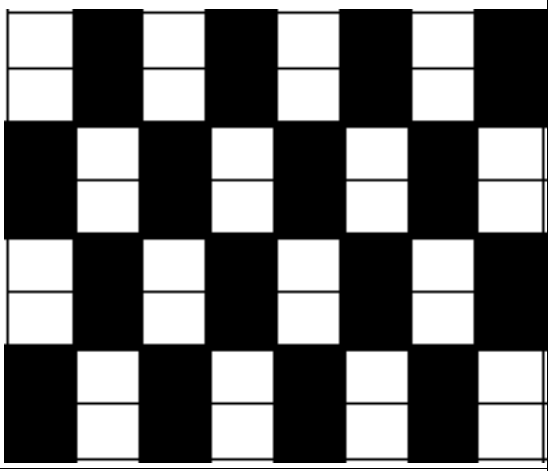
Plain weaves are basically three types. They are:

- Warp Rib
- Weft Rib
- Matt Weave

Warp ribs are a modified form of plain weave. It has 1/1 interlacements in the filling direction, which differs from the simple plain weaves. This modified interlacement results in the formation of cords, ridges, or texture across the warp direction of the fabric. These cords or ridges are formed due to the grouping of the filling yarns. The repeat of warp rib is always on two warp yarns. The first warp yarn follows the formula, while the second warp yarn is in the opposite direction of the first one. It requires two heald frames at least, but multiple of these can also be employed. The number of weft yarns in a repeat unit of this

weave is equal to the sum of the digits in formula of warp rib. For example, 2/2

warp rib requires 2 warp yarns and 4 weft yarns. Design of the above- stated warp rib is shown in Figure-3. Warp rib isalso known as ottoman.



Plain w
structur

Warp rib (2/2).

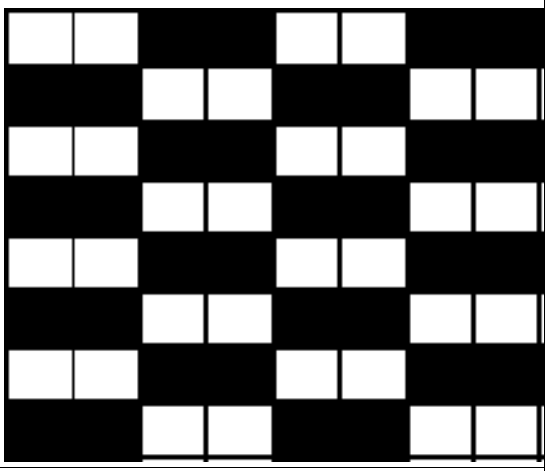
Warp rib are two types:

- Regular Warp Rib
- Irregular Warp Rib

Weft rib:

Weft ribs are another modified form of plain weaves. It has 1/1 interlacements

in the warp direction, which differs from the simple plain weaves. This modified interlacement results in the formation of cords, ridges, or texture across the weft direction of the fabric. These cords or ridges are formed due to the grouping of the warp yarns. The repeat of weft rib is always on two weft yarns. The first weft yarn follows the formula, while the second weft yarn is in the opposite direction of the first one. It requires two heald frames at least, but multiple of these can also be employed. The number of warp yarns in a repeat unit of this weave is equal to the sum of the digits in formula of warp rib. For example, 2/2 weft rib requires 2
weft yarns and 4 warp yarns. Design of the above-stated warp rib is shown in Figure-4. Weftrib is also known as half panama.



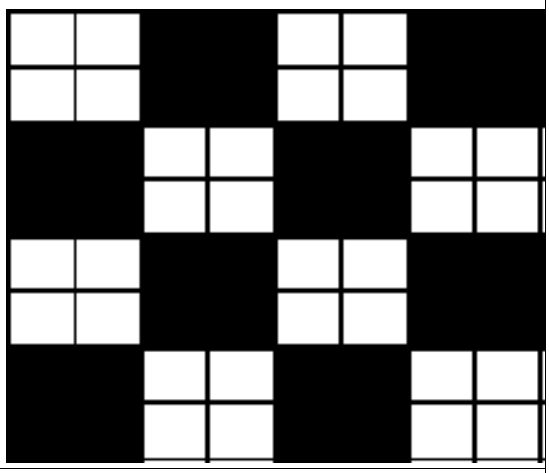
Weft rib (2/2).

Weft rib is two types:

- Regular Weft Rib
- Irregular Weft Rib

Matt weave:

This type of weave is constructed by extending the plain weave in warp and weft directions at the same time so that two or more threads work alike in both directions. In this weave, the same size of squares appear on both sides of the fabric showing the same number of warp and weft yarns on front and back of the fabric. Matt weave is also commercially known as basket, hopsack, or full panama. This weave requires a minimum of two heald frames. Design of the 2/2 matt weave is shown in Figure-5. The matt weaves can be extended further to give more prominence but restricted due to loose structure and modified in several ways. In matt weave, the warp ends that work alike tends to twist around each other. To avoid this twisting of the yarns, warp ends that work alike are drawn from different slits of the reed.



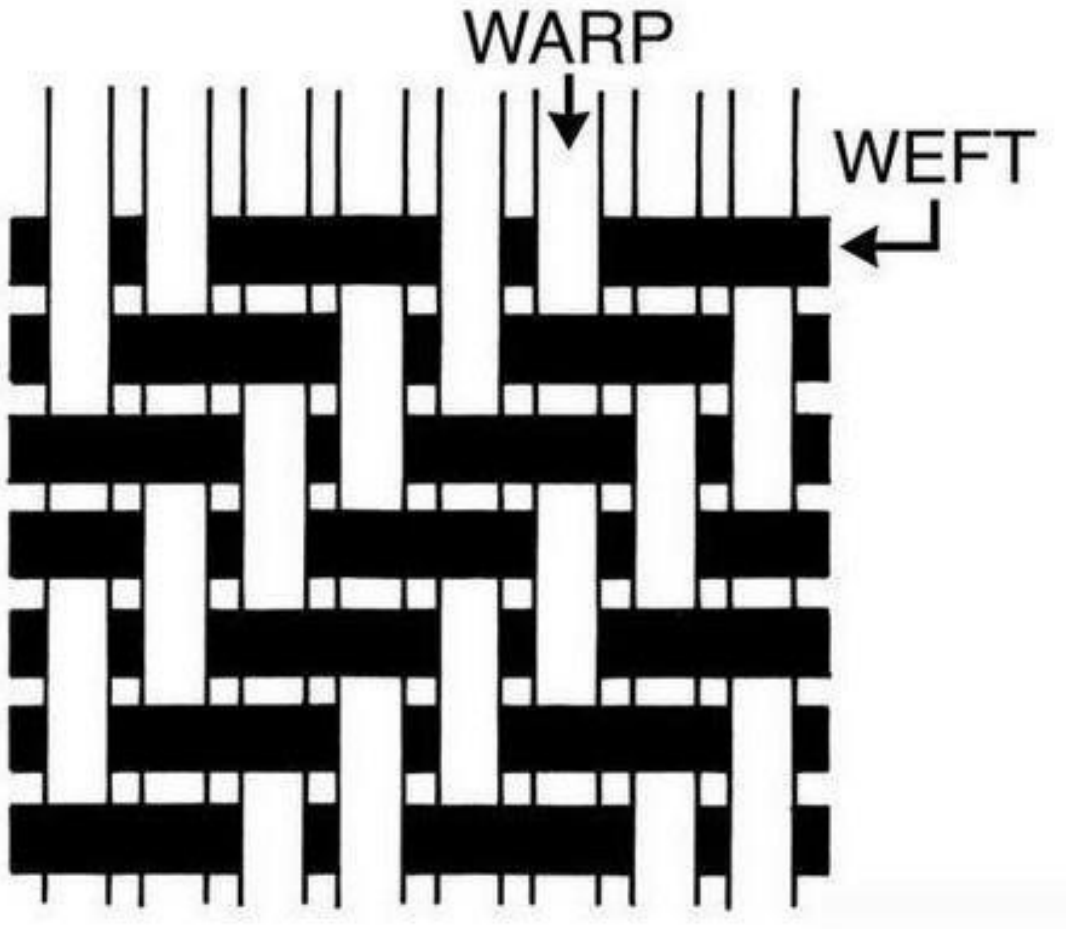
Matt weave (2/2).

Matt weave are three types:

- Regular Matt Weave
- Irregular Matt Weave
- Fancy Matt Weave

Twill Weave:

Twill weave is another basic weave which is well known for its diagonal line formation in the fabric due to its interlacing pattern. This weave and its derivatives are used for the ornamental purposes. Twill has closer setting of yarns due to less interlacement imparting greater weight and good drape as compared to the plain weave. In simple twill, the outward and upward movement of the interlacing pattern is always one that imparts a diagonal line to this design. The direction of the propagation of twill line classifies twill into right-hand or left-hand twill. Twill weaves find a wide range of application such as drill cloth, khakhi uniforms, denim cloth, blankets, shirtings, hangings and soft furnishings

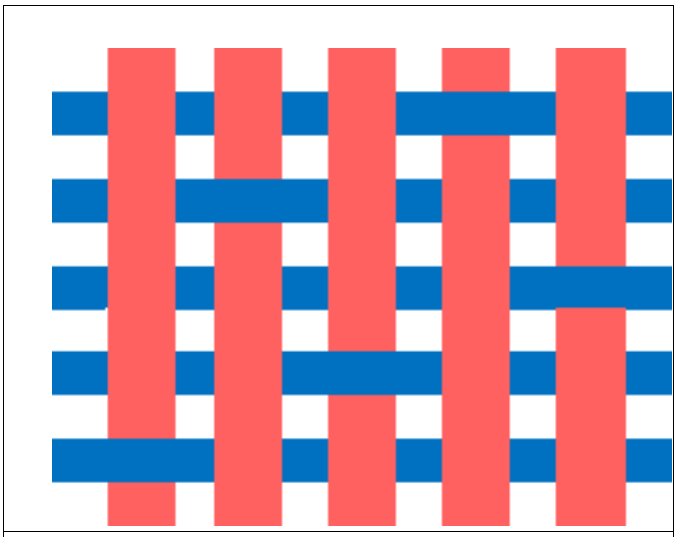



Twill weave

Satin/Sateen:

Satin/sateen is a basic weave that does not have any regular pattern like twill. The surface of the fabric is either warp or weft faced. Satin is warp faced, which means that all the surface of the fabric will show the warp threads except for the one thread interlacement with other series of yarn. If it is weft faced, then it will be known as sateen, which means that fabric surface will show the weft threads mostly. The unique in this weave is the single interlacement of

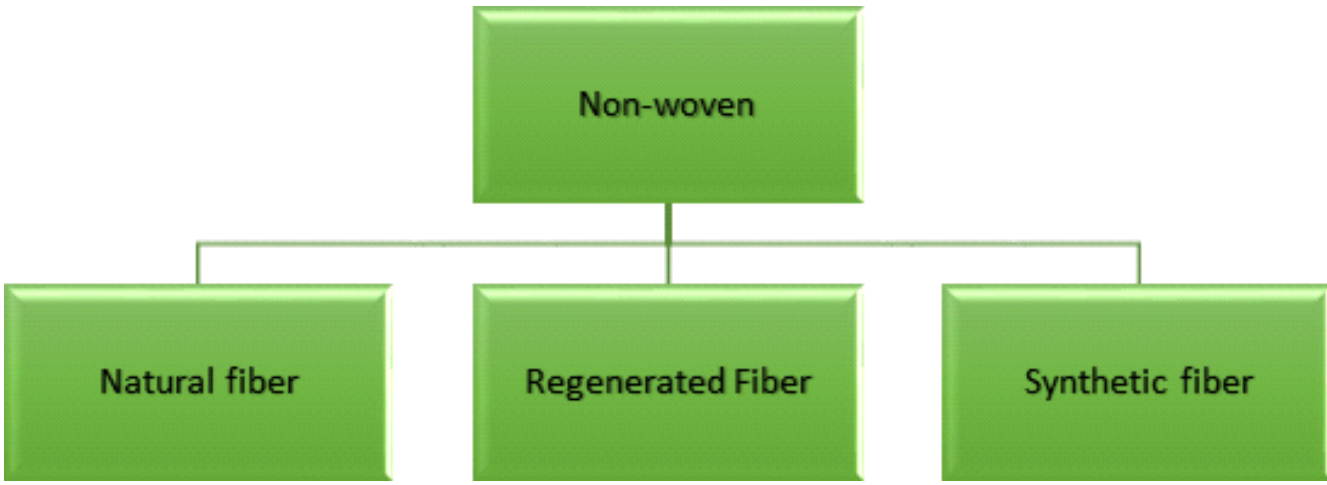
warp thread and weft thread in a single repeating unit. These weaves have the least interlacement points among the basic weaves. Due to this reason, it gives the surface of fabric more luster and smoothness. Along with these properties, more close packing of the threads is possible, which gives the maximum achievable cover factor in this weave. With this weave it is possible to use a cotton warp and silk filling, having most of the silk appear on the surface of the fabric.



Satin weave

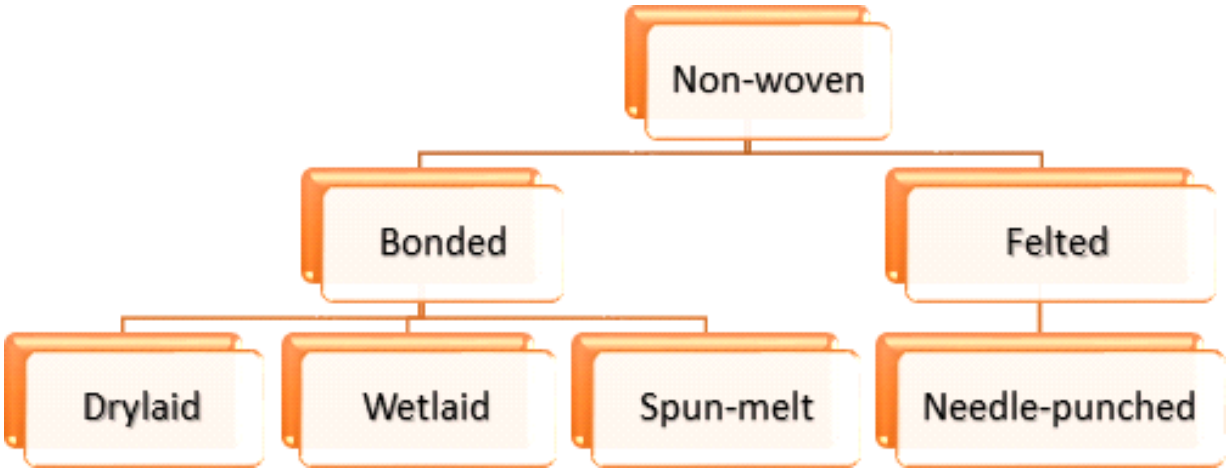
NONWOVEN FABRICS

Nonwoven fabric is a fabric-like material made from staple fibre (short) and long fibres (continuous long), bonded together by chemical, mechanical, heat or solvent treatment. The term is used in the textile manufacturing industry to denote fabrics, such as felt, which are neither woven nor knitted.




Felting

Felting, in my words, is the process of producing a textile or fabric by combining and compressing the loose fibers, wool or hair.




According to ASTM, felt is a structured build-up from the interlocking of fibers by a suitable combination of mechanical work, chemical action, moisture and heat without spinning, weaving, or knitting.

Other Felted Fabric Cotton felt, jute felt, Flax Felt, Synthetic Fiber Felt fabric.

Colored Felted Fabric (Synthetic Fiber).

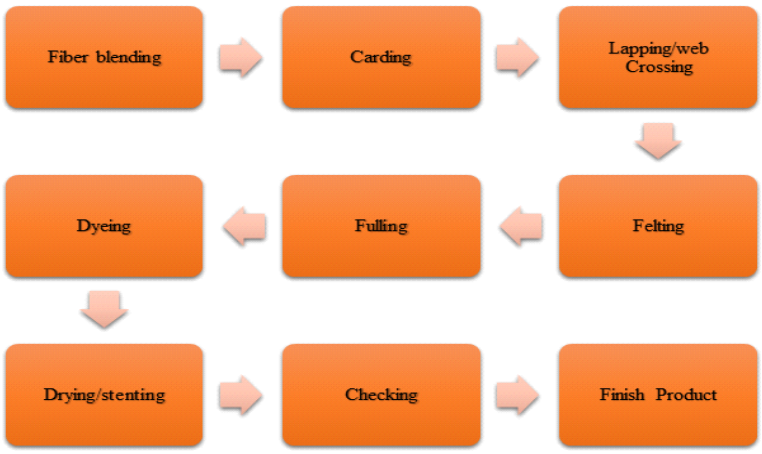
Manufacturing process: Felt is manufactured either manually or by machine. Machine-made felt manufacturing is described in the following. Fiber is

subjected to two consecutive carding operations and the two carding operations make the fibers parallel and of even thickness in the form of a fine web.

Recycle cotton Felted Fabric (Geo-Textile, Insulator)

Several layers of web are built up until a sufficient amount of weight or thickness has accumulated. The mass or batt (layer of web) is then cut and the edges trimmed to the desired width. The batts are usually about 37m long, 150-230 cm width and their weights vary from 8-23 kg.

The batts are evenly sprinkled with warm water, pass over a steam box to warm the fabrics thoroughly and then press between two rollers.




The manufacturing process of non-woven fabric

The top roller rests on the batt and with an oscillating motion exerts the pressure that combined with moisture and heat produces the final felting action. Then they are allowed to draining and cooling off for about 24 hours.

Application

Geo-Textiles: (Road construction, rail line Construction, River Bank Construction) Mattress, foam, floor cover, composite.
BONDED FABRIC

Bonded non-woven fabric:

Nonwoven web formation methods are classified according to the form of raw materials chosen for the specific application. Staple fiber and filaments are used to fabricate nonwoven webs.

Bonded Non-woven techniques are:

- Dry-laid
- Wet-laid
- Polymer-melt/ spun-melt

Dry-laid web formation: Dry-laid web formation is one of the old techniques and is very similar to the felting process. For the production of dry-laid web, carding machines and web lappers are used to layer the fibrous batt. The fibrous web layers are subsequently felted using heat, moisture, and agitation. These materials may be of natural or synthetic polymer composition and can be processed alone or in blends. Carded webs are produced from either short-staple fiber (20–60 mm) or long-staple fiber (50–150 mm).
The dry-laid web formation technique, such as fiber preparation, blending, carding, and garnering are innovations of the textile industry. These processes prepare staple fibers, blend them, and layer the fiber batt in a dry state. In dry-laid web formation, the fibers are collected into a web form by parallel lapping, cross-lapping, or aerodynamic (air-

laid) lap forming and then bonded by means of mechanical needles, hydro-entanglement, chemical adhesives, and thermal bonding methods.

Raw material: Cotton fiber, synthetic Fiber, Viscose fiber, Short cotton fiber.
Application of dry-laid

- Diapers
- Baby wipes
- Feminine Napkins
- Tampons
- Adult Incontinence Products
- Medical textile

Wet-laid web formation: Wet-laid forming, which can be regarded as being analogous to conventional papermaking processes but with use of chopped synthetic or staple fibers, continues to draw attention as an advantageous way to prepare advanced nonwoven textile products. The wet-laid web forming system is designed to fabricate short fibers dispersed in liquid, which are subsequently layered. The wet-laid method is specifically suitable for the large scale production of disposable products, such as tea bags, aprons, gloves, napkins, and surgical gauze.
Raw Material: A wide range of natural, wood pulp, mineral, synthetic and man-made fibers of varying lengths can be used such as glass, polyester, polyamide, and regenerated fiber.

Applications: Filter paper, Tea Bag Fabric, Napkin, Surgical gauze.

Spun-melt non-woven fabric: Spun-melt is a generic term describing the manufacturing of nonwoven webs directly from thermoplastic polymers. It encompasses 2 processes,

- Spun-bond Non-woven
- Melt-Blown Non-woven

Spun-laid (bonded) Non-woven: Polymer granules are extruded into filaments through so called spinnerets. The continuous filaments are stretched and quenched before

being deposited on conveyor belt to form a uniform web. The spun-laid process results into nonwovens with an increased strength compared to carding, due to the attenuation of the filaments. The downside is that the choice of raw materials is more restricted. Co- extrusion of two components leads to bico fibers, either adding more properties to the web or allowing air-through bonding. Please note that the word spunbond is reserved for thermo bonded spun-laid.

Raw material: PP (polypropylene), Pet, Nylon, PE, Polyester. (Synthetic Thermoplastic Resin).

Manufacturing Process:

Application: Packaging (Shopping Bag), PPE for medical,

Melt-blown non-woven: Meltblown, like spun-laid, starts with extruding a low viscosity polymer. But instead of quenching the filaments when they leave the spinneret, the filaments are being attenuated by hot air streams, keeping the filaments in a partially molten state. This leads to much thinner filaments, with low tensile strength. The filaments hit a belt or a conveyor belt where they form a web.



Figure 10: River bank, road and railway construction.

Raw material: Polypropylene (PP), polyamide (PA), Polyester, Polyethylene (PE).

Some of the processed polymers are:

- Polypropylene is the most used polymer for melt-blown technology.
- Polypropylene is easy to process and makes good web.

- Polyethylene is more difficult to melt-blow into fine fibrous webs than is polypropylene.
- Polyethylene is difficult to draw because of its melt elasticity.
- PBT processes easily and produces very soft, fine-fibered webs.
- Nylon 6 is easy to process and makes good webs.
- Nylon 11 melt-blows well into webs that have very unusual leather-like feel.
- Polycarbonate produces very soft-fiber webs.
- Polystyrene produces an extremely soft, fluffy material with essentially no shot defect

Manufacturing process: The melt-blown technology is based on a melt blowing process, where, usually, a thermoplastic fiber-forming polymer is extruded through a linear die containing several hundred small orifices. Convergent streams of hot air rapidly attenuated extruded polymer streams to form extremely fine fiber (1-5 micro- meter). The attenuated fibers subsequently blown by high viscosity air onto a collector conveyor, thus forming a fine fibered self-bonded non-woven fabric. Applications: Filter paper, N95 mask (as filter fabric), PP Gown, surgical mask, Napkin, Teabag fabric, water filter.

- Face Mask
- Package
- Teabag
- Silica gel bag
- Sanitary materials
- Warm filling material
- Filtering material
- Diapers and sanitary pads

Mask

N95 mask: An N95 respirator is a respiratory protective device designed to achieve a very close facial fit and very efficient filtration of airborne particles.

The ‘N95’ designation means that when subjected to careful testing, the respirator blocks at least 95 percent of very small (0.3 micron) test particles. If properly fitted, the filtration capabilities of N95 respirators exceed those of face masks. However, even a properly fitted N95 respirator does not completely eliminate the risk of illness or death. Surgical N95 Respirators are commonly used in healthcare settings and are a subset of N95 Filtering.

Manufacturing Technology: 5-layer Fabric.

Surgical mask: A surgical mask is a loose-fitting, disposable device that creates a physical barrier between the mouth and nose of the wearer and potential contaminants in the immediate environment. These are often referred to as face masks, although not all face masks are regulated as surgical masks.

- It is tested for fluid resistance, filtration efficiency (particulate filtration efficiency and bacterial filtration efficiency).
- It should not be shared or reused.

Braiding

Braiding consists of three or more yarns mechanically intertwined in such a manner that no two yarns are twisted around one another. The braids are continuous, which enables the load to be evenly distributed throughout the structure. These fibers are coiled into a helix, similar to wire in a spring.

Tubular braid features continuous seamless fibers from end to end of a part. The braided fibers are manufactured in the form of sleeves, wide fabrics or flat tapes. The

sleeves have the 'Chinese finger-trap'-effect so that it conforms to the shape it is reinforcing.

## Benefits of Braided Fibers

The following are the key benefits of braided fibers:

- Generally, when a structure is exposed to elevated fatigue cycles, micro-cracks tend to occur through the matrix of unidirectional prepreg laid-up structures. The micro-cracking can, however, be stopped at the intersections of the reinforcing yarns, thus enabling this material to be easily adapted for use in the aerospace industry.
- The efficient distribution of load in a braided structure enhances its impact resistance.
- Braids improve interlaminar shear properties when combined together with other braids. Interlaminar adhesion in braided structures enables the layers to move together, which helps to prevent cracks.
- As braids are woven on a bias, they provide very efficient reinforcement for parts that are subjected to torsional loads.
- Braids can be easily and repeatedly expanded to fit over molding tools or cores. They can accommodate straight, uniform cross-section forms as well as non- linear, irregular cross-section components.
- Braids can be designed with high level of flame resistance, abrasion resistance, flexibility and expandability.

## Applications

Braids are used in many industrial applications. Some of the common applications are listed below:

- As fan blade containment in commercial aircrafts
- For energy-absorbing crash structures in Formula One racing cars

- As reinforcement for aircraft propellers and stator vanes in jet engines
- For building light weight frames and structures such as trusses
- For use in precise manufacture of composite parts
- Ideal reinforcement for drive shafts and torque transfer components, such as flanged hubs
- For products with changing geometries like prosthetics and hockey sticks.

Crocheting

Crochet is a process of creating fabric by interlocking loops of yarn, threads, or strands of other materials using a crochet hook. Crochet is slightly different from that of knitting. Crochet completes stitches and then proceeds to the next one while knitting have many stitches open at a time.

ADVANTAGES

- Easy to learn
- Easier to recover from mistakes due to fewer live stitches
- Cost-effective in terms of investing in materials
- Portable
- Inexpensive way of making clothing and accessories
- Several health benefits such as stress relief, toning of eyes and muscles in the fingers, staves off Alzheimer's

DISADVANTAGES

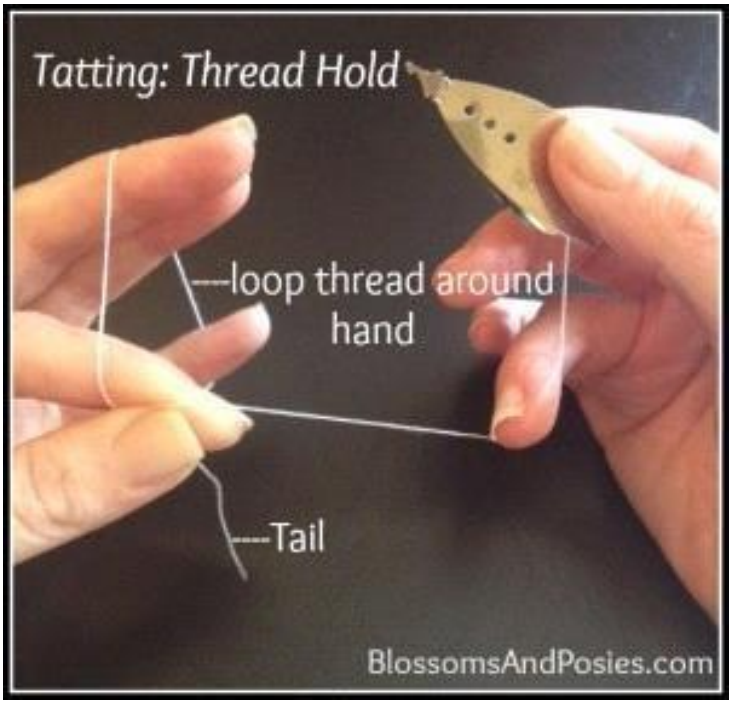
- Limited stitches and patterns
- Thicker stitches that can lead to bulkier garments
- Colourwork might not come out very neatly
- Does not have a wide market

Tatting

Tatting is an old-fashioned decorative art that probably originated in the early 1800's in Europe. Tatting is lacework that's made using fine thread and a small, oval shaped handheld shuttle.

First, thread is wound onto the shuttle. A right handed tatter would hold the shuttle in their right hand. This would be their "working hand."

The long tail of the shuttle thread is then looped around the left hand and the working hand then weaves the shuttle thread back and forth through the loop, which is actually called a "ring."




Essentially, tatting is knot-making

Each tatted stitch is composed of two parts. When combined, the two parts make one knot that sits on top of the loop. Many stitches are tatted alongside each other on the same loop, or ring. The key is that each knot must slide along the ring so that when the

ring thread is pulled tight it forms a closed ring of tatted stitches. In tatting, if a stitch isn't formed properly the ring won't close. (Remember that tatting is knot work, so the mistake must be unknotted or "picked out", or the work must be begun again.)
A chain stitch can also be created (using an additional ball of thread – see photo below.) Tatting is easily recognized in that it consists of rings and chains.

Unit 3: Surface Ornamentation

## SURFACE ORNAMENTATION

Fabric embellishments are decorations that are normally added or attached to fabrics to make them more beautiful and add more value in terms of money. Today adding embellishments has become the ultimate tool of the decorator.. The embellishment on fabric can be achieved through printing, tie-dye, batik, stencils, lamination, bonding, Decorative cutting,Special seam applying and etc. The most important thing which designers should keep in the mind while embellishing the fabric is “principles of arts”. The design should have balance, proportion, emphasis, variety, movement, rhythm, and harmony.

“Textile embellishment refers to the process of adding color, pattern, texture or design to fabric through the use of outside mediums such as thread, ribbon, sequins, yarns, buttons, buttonholes and more” . Decorative design incorporates only exterior in the garments. It neither affects fit nor performance of the garment, but contributes to the over all purpose of the garment. It is least important among the three aspects of a design. It acts sub ordinate to and must agree with both structural and functional design. Functional components of the garments like openings, belts, buttons, structural seams, darts, gathers may be decorative due to the visual stimuli they provide besides contributing to the fit and performance. The design that offers only visual effects is decorative only . The colour, constructional details and decorative trims are three common ways to incorporate decorative design into structural design. A well designed garment thus offers adequate visual stimuli through structural lines and shapes, attractive fabric colours and creatively used textures.

Importance of Embellishments

· Embellishment is important as decorative detail or feature added to something to make it more attractive.

· Add value to the fabric.

· To make a product better than what it is already.

· To add beauty and increase profit in fabric.

· Make fabric good according to the taste and demand of consumer.

· Make fabric elegant and attractive with different techniques.

It is necessary for both male and females fabrics if enhance the beauty. There must be some limits of embellishment for male fabrics and even for female fabrics. The age of the end consumer plays a vital role in the fabric embellishment. It also depends upon the likes and dislikes of individual which vary from individual to individual.

Advantages of Embellishments

· Identity and Creativity.

· Add beauty to the fabric and Garment.

· Increase the value of the fabric and the Garment made out of it.

· Shows the personality of the wearer.

· Attract consumers.

· Simple material can be converted into many styles and shapes.

Types of textile embellishment techniques inwards sewing in addition to crafts: Here I volition bring upward the types of embellishment methods that are used to decorate surface pattern on textile or garments.

- Printing
- Dyeing
- Embroidery
- Quilting
- Appliqué
- Patchwork
- Trimming (Fringe trim, Sewing trim)
- Lacework (either pre-made or home-made)
- Piping (made from either self-fabric, contrast fabric, or a merely a cord.)
- Beads
- Batik
- Smocking
- Painting

Some other embellishment items that are used on garments for enrich beauty. For example:

- Buttons
- Zippers
- Buckles
- Grommets
- Sequins

In add-on to the multitude of structure in addition to finishing techniques used, the textile tin dismiss also live worked upon or embellished inwards a diversity of ways to lift its surface. Most embellishing methods, such every bit embroidery, quilting, applique in addition to bead-work are age-old techniques of decorating textile in addition to are yet largely executed past times hand. Influenza A virus subtype H5N1 specialized industrial sector inwards trimmings, lacework, embroidery in addition to other embellishments has also developed that uses innovative technology scientific discipline to recreate the hand-worked effects on an industrial scale in addition to pace.
2.Techniques of Embellishing on Garments

A few textile surface embellishing techniques are briefly discussed inwards below: Printing: Textile printing is the process of applying colour to fabric in definite patterns or designs. In properly printed fabrics the colour is bonded with the fibre, so as to resist washing and friction. Textile printing is related to dyeing but in dyeing properly the whole fabric is uniformly covered with one colour, whereas in printing one or more colours are applied to it in certain parts only, and in sharply defined patterns.
In printing, wooden blocks, stencils, engraved plates, rollers, or silkscreens can be used to place colours on the fabric. Colourants used in printing contain dyes thickened to prevent the colour from spreading by capillary attraction beyond the limits of a pattern or design.

Dyeing; Dyeing is the application of dyes or pigments on textile materials such as fibers, yarns, and fabrics with the goal of achieving color with desired color fastness. Dyeing is normally done in a special solution containing dyes and particular chemical

material. Dye molecules are fixed to the fiber by absorption, diffusion, or bonding with temperature and time being key controlling factors. The bond between dye molecule and fiber may be strong or weak, depending on the dye used. Dyeing and printing are different applications; in printing, color is applied to a localized area with desired patterns. In dyeing, it is applied to the entire textile.

Embroidery:Embellishing fabrics amongst stitches inwards yarn or thread, using a needle, is 1 of the oldest forms of art. While the library of embroidery includes hundreds of varieties of stitches, they tin dismiss live categorized broadly into 4 principal techniques – raised operate or stump-work where raised effects are created past times stitching over pads of wool in addition to cotton; couched operate – creating a pattern amongst cords past times sewing them onto the base of operations fabric; fl at running in addition to filling stitches of which at that topographic point are hundreds; in addition to counted thread embroidery, e.g. needlepoint in addition to cross stitch, where the stitches are placed over a counted let on of threads of the base of operations fabric. Schiffli embroidery is an instance of machine embroidery made on the 'Schiffli' machine that industrial plant sideways amongst a K needles. This machine embroiders amongst a top, decorative in addition to a back, binding yarn, in addition to is used for making laces in addition to sheer drapery fabrics. Many embroidery stitches tin dismiss right away live produced inwards digitized embroidery machines which, for large scale production, conduct keep multiple heads to attain a let on of identical designs simultaneously using an embroidery software program.

Quilting: Quilting is the technique of Embellishing fabrics stitching together, past times manus or machine, multiple layers of textile amongst a filling of cotton, foam or polyester batting inwards betwixt the layers. Quilting is widely used for making bedspreads, quilts, comforters etc. Single-needle, hand-guided quilting machines are used for making outline quilting, where the stitching lines follow the outlines of the impress design, vermicelli, which uses gratis motility all-over stitching patterns, in addition to trapunto or Italian quilting, a shape of 'couching' where a cord inserted in addition to stitched betwixt the textile layers creates a raised pattern. In mass-scale

automated production, multiple-needle machine quilting is used to brand uncomplicated geometric patterns. In stitch-less quilting, multiple layers of textile are fused together thermally or past times an adhesive, creating the appearance of stitched.

Applique:In applique, pocket-size pieces of textile or other stuff are couched or stitched onto a base of operations fabric. In contrary appliqué, the base of operations textile is on overstep of the stitched textile in addition to the overstep textile is cutting out to reveal the appliqued textile underneath.

Patchwork:Patchwork, used to a greater extent than oftentimes than non for making bed quilts in addition to cushions, is the technique of creating a textile layer past times joining pocket-size pieces of textile (traditionally scraps of quondam clothes or textiles) inwards geometric or abstract patterns. Being a hand-worked technique, it is to a greater extent than oftentimes than non produced on a pocket-size scale.

Trimming:Two types of trimmings are virtually popularly applied on textile or garments for decoration. Such as:

- Fringe trim: Fringe is an ornamental textile trim, applied to an border of an item, such every bit drapery, clothing ends, a flag, epaulettes, or decorative tassel, etc.
- Sewing trim: sewing Trim or trimming inwards have on in addition to abode decorating is applied to ornament or Embellishing fabrics such every bit gimp, ribbon, ruffles, button, bias tape, etc.

Lacework:Lace is an openwork fabric, patterned amongst opened upward holes inwards the work, made past times machine or past times hand. Lace is about other Embellishing items on fabric. It is the rattling mutual in addition to ancient arts and crafts to Embellishing fabrics.

Piping:Piping is a type of cut back or embellishment, which is used to Embellishing fabrics for making dissimilar mode line. Usually the textile strip is cutting on the bias, in addition to oftentimes it is folded over a cord. It may live made from either self-fabric

(the same textile every bit the object to live ornamented) or contrasting fabric, or of leather.

Beads:Beads are other types of embellishment. Beadwork is made past times needle in addition to thread to stitch beads to Embellishing fabrics, suede, or leather.

Batik:Batik is a cloth that is traditionally made using a manual wax-resist dyeing technique. For Embellishing fabrics batik is the rattling pop embellishment technique.

Smocking work

Smocking is an embroidery technique, used to et together textile in addition to then that it tin dismiss stretch. Before elastic, smocking was commonly used inwards cuffs, bodices, in addition to necklines inwards garments, where buttons were undesirable.

Fabric painting :techniques are ways of creating colorful pictures and designs on fabric using paints and brushes, markers or stencils. ... Painting over the stencil leaves the design on the fabric. In serti painting, often done on silk, a design is drawn on fabric and traced with a resist, a thick liquid that repels paint.

Fabric manipulation:There are dissimilar types of textile manipulation techniques. They include: Embellishment through addition, Beads in addition to beading, embellishment through subtraction in addition to structure techniques.

## 3 PRINTING AND DYEING

Block Printing

Hand Block Printing on textiles refers to the technique by which carved wooden blocks covered with dye are repeatedly pressed along a length of cloth to create patterns. The beginnings of the art of ornamenting textile fabrics by the stamping or printing on of coloured designs are lost in antiquity.

Block printing is believed to have originated in China towards early 3rd century. Around the 4th century, records of its presence were found in Egypt and some Asian countries from where it spread to Europe and other places.

Block printing was first developed in China and is said to be over 2000 years old. However, the earliest known example is the Diamond Sutra from 868 AD which is currently in the British museum.

## HAND BLOCK PRINTING IN INDIA

India has been renowned for its printed and dyed cotton cloth since the 12th century and the creative processes flourished as the fabric received royal patronage. Evolution of different styles of designs has taken place in different parts of the country having its own particular local aesthetic.

Block Printing is mainly practiced in the

*Andhra Pradesh:*One of the earliest and complex techniques of block printing is Kalamkari. It was developed in Machilipatnam in Andhra Pradesh. It uses vegetable dyes for printing. The craft evolved with patronage of the Mughals and the Golconda sultanate at Pedana near Machilipatnam in Krishna district.

*Gujarat:Hand* printing has been practiced in Gujarat by the Paithapur families. They use the mud resist – printing method to print their textile and make intricate blocks. These prints are called Sodagiri (trader) prints. The popular patterns in Kutch are black and red designs of dancing girls, birds and animals. The saris of Ahmedabad and Baroda have large mango patterns against a red or blue background. The Ajrak resist-printing technique is found in Anjar and Dhamadka in Kutch. In several patterns, the painted Ajrak cloth has various colours like red, blue, black and white. The other well known centers for Block Printing in Gujarat are Bhavnagar, Porbandar, Vasna, Rajkot, Jetpur and Jamnagar.

*Rajasthan:*In Rajasthan, colorful Block Prints of birds, human figures, animals, gods and goddesses are famous. The main centers for this type of Hand Block Printing are Jaipur, Pali, Bagru, Barmer and Sanganer. Barmer is well -

known for its prints of red chillies with blue-black outlines, surrounded by flower- laden trees. The Sind region is the source of inspiration of these prints. Turbans, sarees and traditionally worn lungis are various items that are made in Barmer. The other famous prints are of horses, lions, peacocks and camels, called Sikar and Shekahawat prints. Villages of Jahota in Jaipur are famous for the jahota hand block printing. Maharaja Jai Singh and his wife are believed to have uplifted this art amongst the local artists. Sanganer and Bagru are the places where most of the Block Printing is done in Rajasthan. Kalamkari Prints and floral motifs with pastel colors are done on the fabric. The block print in Bagru is done mainly in black, red and beige. Shades of blue with more use of indigo blue dyeing processes are a characteristic of this centre. Hand block printing was patronised by the royal family. Sanganer, near Jaipur, is famous for its fine hand block printing in subdued colors. In Rajasthan, there are sandy stretches of desert where a unique method of cloth- dyeing is prevalent. The method is called Ajrakh and the print is in dark shades of blue and red with geometrical. The traditional block-printing running in parallel lines technique of Ajrakh has attain a peak of excellence at Balotra. The Resist Process called Dabu is used here involves using wax or gum. In the border town of Jaisalmer a kind of resist printing requiring very low temperatures is done. Therefore, it can only be processed during the night or in winter. Odhnis / chunris from Jodhpur are highly prized though they are made all over the state now. Udaipur and Nathdwara, the temple city here the designs are mostly religious in nature and are linked with Srinathji Lord Krishna.

*Madhya Pradesh:*

Printed textiles are created by a community of printers called Chheepa (derived from the Hindi word chhapna meaning printing) in Madhya Pradesh. The printers of Bagh use vegetable and Natural Dyes, in bright shades of red and black and also occasional indigo. These prints have a tonal and a three dimensional effect which is impossible to replicate in the screen printing or machine printing process. The blocks are made of intricately stylized motifs,

which have evolved over hundreds of years. Bagh, which lends its name to the Bagh prints, is a small tribal town in Dhar district of Madhya Pradesh. The khatri community, who comprise the 'chhipas' or printers came here about 400 years ago. Javad prints in Indigo and Alizarine are used most of the time. In the wax resist process done here the wax is applied using the block which is carved upto 10 cm in depth. Other places in Madhya Pradesh besides Bagh are Behrongarh, Indore, Mandsar, Burhanpur.

*Uttar Pradesh:*Uttar Pradesh is an important centre for hand-block printing with the paisley designs, classical butis and the tree of life as the main traditional motifs used in a range of shapes and in bold colors. In Uttar Pradesh Benares, Farrukabad, Pilakhuan are the place where the blocks are made.

*WestBengal Kolkata &Serampur :*Each of these regions traditionally had distinct design elements with unique color schemes and motifsblock printed fabricby expert craftworkers from each of these regions are still identifiable by its region of origin.

TYPES OF BLOCK Mainly two types of blocks used by the printer at the time of printing

i. Wooden block: which is also two types

a. Outlining block *(rekh)*

b. Filling block *(gadh*

Blocks are hand carved of seasoned teak wood by trained craftsmen. On the bottom face the motif are engraved with steel chisels of different widths and cutting surface by the carver. Each block has a wooden handle and two to three cylindrical holes drilled into the block for free air passage and also to allow release of excess printing paste. To soften the grains in the timber, the new blocks are soaked in oil for 10-15 days. These blocks sometimes have metal over the wood.

**ii.** Metallic block

Metal sheets are beaten by hand and made wafer thin and malleable. Then, the thin sheets are cut into strips of even length. The pattern or design of the block is drawn on the wooden block and the thin metal strips are pressed onto the design and gently hammered in. The designs are filled in from the center to the outside to allow maneuverings of the hand. After the design is completed the design is checked to see if all the brass strips are of the same height from the wooden base as it ensures good quality of printing. Brass blocks are used in case of very fine designs and for a high level of clarity in print. They are more expensive and time consuming to make and also last much longer.

BLOCKS ON THE BASIS OF DESIGN

There are mainly three types of designs are carved on block:

1. Geometrical Design (lines and geometrical motifs are carved)
2. Floral Design (paisley, flowers, tree leaves wines etc.)
3. Tribal Design (daily life of tribal people)

Depending on the design, the shape (circular, square etc.) of the blocks can vary.
Blocks are mainly made in Farukhabad in Uttar Pradesh, and Paithapur in Gujarat. Banaras block *makers design their blocks to suit fine silk printing - sometimes seven colors are used in each design. Block designs get bigger and bolder and the delicacy is lost as one move towards the south or towards East. Mainly the blocks are 8cm-11 cm in breadth and 10cm-*18cm in length. The sizes of blocks depends upon the design, sometimes it may be smaller and sometime may be larger than it.
For the making of blocks mainly two types of seasoned wood are used

i. Shisham (qualities same as sagwan, but require little more force during application)

ii. Sagwan (good capability of observing color and do not loose shape when water is applied.)

Characteristics of block:

i. Carving should be deep upto 2-3cm. ii. Surface evenness must be there.

iii. A hole should be there for exit of air

iv. Bonds of repetition.

v. Normally the cost of block ranges from Rs.300-Rs. 4000/piece depending upon the design and type of wood used

TECHNIQUES OF BLOCK PRINTING

Block printing can be divided into three ways

- Direct Block Printing:

  The cotton or silk cloth is first bleached in this technique. Then the fabric is dyed, unless a light background is desired. Thereafter, the fabric is printed using carved blocks; first the outline blocks are used, then the ones to fill color. The popular prints of Bagh (from Madhya Pradesh) and Bagru (from Rajasthan) are made using this technique. Either Cotton or silk fabric is used here. The cloth is first bleached and then dyed with the desired color. After that block printing is done on borders with carved wooden blocks then in the borders.

-

  In the resist technique, areas that are to be protected from the dye are covered with a mixture of clay and resin. Then, the dyed fabric is washed. Producing a rippled effect, the dye spreads into the protected areas through cracks. Block prints are then used to create further designs. Ajrakh

Printing of Kutch (India) and Sindh (Pakistan) and Kalamkari from South India use this technique.

- Discharge
  Printing:
  The fabric is dyed in this technique. Then, a chemical is used to remove the dye from the portions that are to have designs in different colour. These portions are then treated, so they may be re-colored.

BLOCKPRINTING
PROCESS

*Step 1:* First, the fabric to be printed is washed free of starch (size material) and soft bleached. If dyeing is required (as in the case of saris where borders or the body is dyed) it is done before printing. The fabric is again washed to remove excess dye and dried thoroughly.


Fig 7: Step 1 – Desizing Process


Fig 8: Step 2 – Attachment of the fabric.

*Step 2:* The fabric is stretched over the printing table and fastened with small pins. This is an important stage as there should be a uniform tension in the fabric with no ripples.

*Step 3:* The dyes or the pigments to be used are kept ready for application


Fig 9: Step 3 – Preparation of colour and block


Fig 10: Step 4 – Preparation of colour tray.

*Step4:* Under the pigment tray is another tray containing a thick viscous liquid made from pigment binder and glue. This gives the color tray a soft base which helps to spread color evenly on the wooden block. Small squeeze is used to spread the color paste over the tray.

*Step 5:* The printing starts from left to right. The color is evened out in the tray with a wedge of wood and the block dipped into the outline color (usually black or a dark color)

*Step 6:* When the block is applied to the fabric, it is slammed hard with the fist on the back of the handle so that a good impression may register. If it is a multiple color design, the second printer dips his block in color again and prints on top of the outline made by the first block. The third color if required follows likewise, precisely aligning the block each time. Skill is necessary for good printing since the colors need to dovetail into the design to make it a composite whole.

Fig 11: Step 5 – Printing over the cloth.

Fig 12: Step 6 – Printing of multi colour.

*Step 7:* The fabric is sun-dried, which is part of the colour-fixing process. It is rolled in wads of newspapers to prevent the dye from adhering to other layers and steamed in boilers constructed for the purpose. Silks are also steamed this way after printing. After steaming, the material is washed thoroughly in large quantities of water and dried in the sun, after which it is finished by ironing out single layers, which fix the color permanently.

MAKING OF DYE PASTE AND COLOR TRAY

*Step 1:* For making the color tray very first dye paste is prepared by mixing thickener, binder and dye. The dye paste should not be very thick (disadvantage: dye will not give even printing) or watery (disadvantage: dye paste will spread over the fabric).

*Step 2:* Now the tray (palia) is taken which is made of wood, generally the size of tray is 7 inches in breadth and 10inches in length and 2 inches deep but sometimes sizes can be varies according to size of block. Now, the dye paste is transferred to the tray *(palia)* from the bucket.

Fig 14: Step 1 – Preparation of the dye solution

*Step 3:* After that put a net like square frame made of bamboo sticks called "*THARTHARI"* (bamboo sticks are tied with nylon thread in form of net) Level of the color will be equal to the level of *harthari* on color tray.

*Step 4:* On the top of the jute fabric, *mulmul* fabric is kept and above *mulmul*, georgette fabric is kept, if we want design with les intricacy. If the block is more intricate, then above the jute fabric, georgette fabric is kept and above georgette, *mulmul* is kept.

DYES USED IN BLOCK PRINTING:

Pigment Dyes -Pigment colors are mixed with kerosene and a binder. The consistency should be just right, for if it is too thick it gives a raised effect on the material, which spoils the design. Small plastic buckets with lids are ideal for storing the mixed colors for a few days. The motif is printed directly on white or light-colored ground with a variety of pigment colors. Pigment colors are widely popular today because the process is simple, the mixed colors can be stored for aperiod of time, subtle nuances of colors are possible, and new shades evolve with themixing of two or three colors. Also the colors are visible as one prints and do not change after processing. Colors can be tested before printing by merely applying it onto the fabric. The pigment color is made up of tiny particles, which do not dissolve entirely and hence are deposited on the cloth surface while rapid dyes and indigo sols penetrate the cloth.

Indigo sols-Rapid fast Colors-In this process, the ground color and the color in the design are printed on white and/or light-colored grounds in one step. The dyes once mixed for printing have to be used the same day. Standard colors are black, red, orange, brown and mustard. Color variation is somewhat difficult and while printing it is not possible to gauge the quality or depth of colorIt is mainly for cotton. The dye easily penetrates through the fabric. The fastness property of the dye is good

Discharge Dyes-These dyes are used if you need to print onto a dark background. Medium to dark grounds are dyed on fabric with specially prepared dyestuff. The printing colors then used on the fabric contain a chemical that interacts with the dye. This interaction simultaneously bleaches the color from the dyed ground and prints the desired color on ts place. Areas can also be discharged and left white. The primary advantage of this process is that vivid and bright colors along with white can be printed on top of medium and dark grounds.

Napthol / Reactive dyes-As the name suggests, these are two sets of chemicals, which upon reaction produce a third chemical essentially colorful in nature. Fabric is dyed in one and later printed with the other. The chemical reaction produces a third color. However, the biggest drawback of this process is that there are just a few chemicals available, which produce colors upon reaction.Vegetable / Natural dyes Historically of great importance, these dyes have acquired even greater importance now because of their eco-friendly nature.

Bagru Black-This is derived by mixing acidic solution of iron - often rusted nails/horse shoes etc. with jaggery (country sugar) allowed to rot for about 10-15 days. Many other natural substances used for producing dyes are pomegranate skins, bark of mango tree, vinegar, slaked lime

Bagru Red -This is derived by mixing acidic solution of iron - often rusted nails/horse shoes etc. with jaggery (country sugar) allowed to rot for about 10-15 days. Many other natural substances used for producing dyes are pomegranate skins, bark of mango tree, vinegar, slaked limethis dye is achieved by combining a source material such as alizarin with alum, the results ranging from pink to deep red.

Indigo Blue-The internationally famous Bagru Blue is obtained from the indigo bush found throughout India.

## INTRODUCTION TO STENCIL MAKING AND PRINTING

The process of Stencil making and printing with the stencil is the first step to modern screen printing technique which is described in Unit 5 (Lessons 13, 14 & 15) of this course. In this lesson you will be introduced to the stencil making and stencil printing processes: The next two lessons will deal with stencil cutting and printing with stencils in greater detail.

## Introduction

Stencil making involves cutting a design through a thin sheet and then transferring colour on to the surface to be printed through the cut out of the design. Printing with the help of stencils is one of the basic fabric ornamentation techniques. This is an art through which designing, printing and decoration can be experimented on different materials apart from fabrics. In this chapter, you will learn about the technique of making stencils and equipments required for it.

## Historical Background

Stenciling technique is an ancient art which is said to have started in China and Japan, and was one of the widely used methods of printing. North Americans were amongst the first to start ways by which the stencils could be used in home decoration . In the 18th century, American wallpaper was considered to be a luxury which only the wealthy could afford. However, the people soon found out that with a little imagination and patience, and by repeating the same motif again and again they could achieve a uniform overall pattern just as good as the one produced by fine printing techniques.

The origin of this technique in India can be traced to the Gupta period (6th to 8th century ) though even before the Gupta period, this process was used in the execution of paintings.

During the Mughal and Rajput periods the use of stencils for the decoration of textile material was very popular.

## Materials and Tools Required

The materials and tools needed for making stencils and using them for printing on fabrics are either available commercially or can be easily made or improvised.

The stencil

The material for making a stencil should be thin and easy to cut. The following materials may be used for this purpose:

- Cartridge sheet
- Ivory sheet
- Bond paper
- Discarded photographic film negatives
- Discarded X-Ray film
- Plastic sheets

Devices for cutting stencils

- Paper cutter• Stencil cutting knife • Scissors• Razor blades
- Metal ruler (for cutting straight lines)

Colours for printing with stencils

There is wide variety of colours ranging from modern synthetic colours to most primitive traditional variety of colours. Some of these will now be briefly described.

- Poster colours: These are water soluble colours which are available in a wide range of shades in liquid form. They are best used undiluted. If they are used on wood, the application of several coats of polyurethane clear varnish, after the paint is quite dry, will render it waterproof and hard wearing as well as increasing the brilliance of the colours.
- Acrylic colours: These are also water soluble and quick drying colours which are available in a wide range of shades in liquid form They also are best used undiluted and maybe used to decorate wood using the same procedure as for poster colours.
- Fabric colours: They are usually water soluble and are fixed by ironing the printed fabric from the backside with a hot iron. Fabric colours can

also be sprayed and can be used on fabrics for stenciling and they produce a very subtle shade.

- Glass colours: These colours are available in a wide variety, ranging from water soluble to gels,
- Acramin pigment colours: Acramin pigment colours are not soluble in water and are used along with SLN binder and other ingredients to form a printing paste.

Tools for applying paint

- Cotton pads

  These are made by enclosing a small cotton ball in a white, coarse cotton rag and then tying it with a knot. This cotton pad helps in applying paint through theopenings in the stencil while printing.It is advisable to have a different pad for each colour to be painted.
- Stencil brushes- A stiff bristle brush (with trimmed bristles)

Other materials

- A sheet of glass to act as a surface for keeping the stencil paper while it is being cut
- Pencils
- Thumb pins
- Adhesive tapes
- Clean rags
- Old newspapers
- Drawing papers
- Carbon paper
- Graphite paper
- Tracing paper
- cleaning solvent like water, spirit etc.

The Stencil Making and Printing Processes

The stencil making and printing processes proceed as follows:

1. Selection of an appropriate design.
2. Transfer of the design on to the stencil material.
3. Cutting of the stencil.
4. Painting through the stencil on to the fabric.
5. Cleaning up of the stencil and brushes.

**1** Selection of a design

An appropriate design suitable for the purpose of decoration in a particular context is first selected. The design can be taken from nature or from the surroundings or it may be based on some geometric pattern, Flowers, leaves, plants, birds or animals . cartoons, magazine illustrations, a piece of art or craft, or one's own drawings, or alphabetical letters etc., all these are appropriate. A bold type of design is good for an efficient stencil printing output . Some bold types of symmetrical designs are shown in . Good, clear alphabetical letters can also be produced easily and quickly using a standard alphabet stencil sheet.

A photocopier may be used to enlarge or reduce the size of the design according to the area of the surface.

**2** Transfer of the design

The next step is to transfer this design onto a stencil card using a tracing paper or a carbon paper. A stencil card can be a suitable paper or plastic material. The stencil material may be fastened on to a glass sheet or a hard cardboard. The design outline is then transferred onto the stencil material using a carbon paper .

**3** Cutting out the design on the stencil After transferring the design on to stencil card, the next step is to cut out the stencil carefully leaving the 'Ties', (explained in Lesson 8) and a thick border around the outline. Keep the stencil sheet on a hard surface, like glass or a hard board, for easy cutting. Cut the entire design through the stencil board, using a stencil-cutting knife or razor blade or a paper cutter.Try to make clean sharp cuts.

4. Printing with the stencil The final and the most interesting part is to use the stencil to print a fabric. This is done by first securing the fabric on a rigid support (like a table) in a tight stretched state and then applying the colour with the help of cotton padding or stencil brush or a painting brush or even a tooth brush. Using any of

these devices, the colour is applied evenly through the openings in the stencil onto wood, plastic, glass etc.

5. Cleaning the stencil Finally the stencil should be cleaned immediately before the paint left on it dries up and becomes difficult to remove. For cleaning, place the stencil on a newspaper and wipe it with a istened with water. Care should be taken that small bridges on the stencil are not broken while cleaning. Brushes should be cleaned thoroughly in solvent and then washed with warm soapy water.

6 Stencil Printing on Different Objects Stenciled motifs can be repeated over and over again to make a border or an all- over design. Delicate flower borders on sheets and pillow-cases or on a child's dress can be very effective, while all-over patterns can be used on a number of items, such as tablecloths, scarves and shirts. Straw hats and baskets, satin shoes and canvas items can all be stenciled.

Stencils can easily be applied to china or glass. As shown in they are used to label food storage jars. The simplest stencils can give character and beauty to any common household object, for example the wooden cups in figure Fig. 7.10. By cutting stencils one can produce designs according to one's own requirements. For example the birds printed at the back side of a plastic chair automatically give the chair an artistic look .

## PRINTING WITH STENCILS

### Introduction

Printing is the final stage after the stencils are cut and the printing paste is ready. This can be carried out in several ways incorporating different ideas and adapting different tools and equipments. By being a little more creative one can achieve novel effects through stencil printing. The broad spectrum of methods and the wide range of effects achieved using these methods, will form the subject matter of this

Assemble the colours to start printing with stencils and also the equipments to paint like, cotton pads according to the colour schemes decided, also arrange for a waste tooth brush and other painting brushes etc.

Printing with Stencils A variety of dyes and pigments can be used for stencil printing and a number of devices can be used to apply the colours. The various types of colours and pigments used for stencil printing were described in Lesson 7. In this lesson we will learn how the colours are applied to the stencil.

Printing by dabbing To start with, the washed and ironed fabric is placed on a rigid support in a tight stretched state and secured in this position with the help of pins. Then the stencil is placed at the appropriate location on the cloth. The stencil is secured with short lengths of masking tape on the cloth

A small amount of print paste is taken in a saucer and a sponge or cotton pad is dipped in it. The colour is applied by gently but firmly dabbing or pressing repeatedly over the open sections of the stencil by moving the piece of cotton or sponge firmly from outside the design outline towards the open areas .The stencil is then carefully removed. The masking tape can be re-used for the next position of the stencil. After the printing is over the fabric is spread in the Sun to let the prints dr Printing with painting brush -Beautiful designs can be stencil - printed on a wooden object using paint. First make sure that the surface is properly cleaned, otherwise the paint will not adhere to that surface. Now start printing following the steps shown in

Spray Printing with Stencil- Spraying (as opposed to sponging fabric dye paste through a stencil) can produce a range of effects from a crisp clear-cut design to a freckled look or a delicately graduated, misty image. Three methods of spraying are described below:

- The first method employs an old toothbrush. The toothbrush is first wetted in paint of the right consistency. With the help of a spatula or a scale or a knife, the paint is spattered on the stencil over the cloth

- The second method makes use of a mouth-blown diffuser (Fig. 9.7). For the diffuser to work successfully it will be necessary to thin the dye paste a little more than that used for toothbrush spattering.

- Finally, the more professional approach is to use an airbrush, which you can buy from a model shop. An airbrush is more conveniently handled for giving misty effect to large printing areas.

Multi coloured design with stencils It is possible to use more than one colour within stenciled shapes by gradually merging one with the other, but you must bear in mind whether the two colours will produce the required effect when they actually meet.

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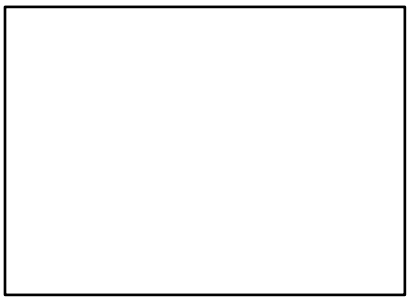
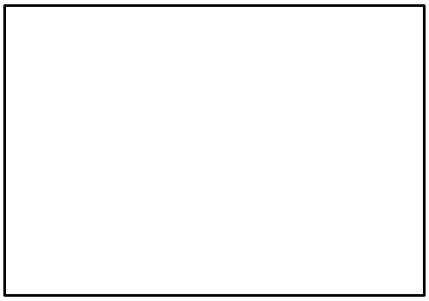




Multi colour printing separate pad is used

Use a fresh piece of sponge for each colour, and use it only for that colour throughout the printing.

- Try printing your design in separate colours . If yours is a large scale design this is quite feasible with stencil printing. The gaps you are not printing should be covered with paper secured by masking tape.

Printing with two or more superimposed stencils More complicated multicoloured designs can be printed by separating the colour and making a stencil for each colour. By using several stencils one over the other, complicated designs can be produced without the insertion of too many ties in just a single stencil.

A Multi coloured design -When a number of superimposed stencils are to be used

.Allow the paint of the preceding stencil to dry completely before positioning the next stencil to paint. Thus with the use of two or more tactically designed stencils beautiful multicoloured patterns can be printed, keeping one over the other one by one.

Making repeats -For printing repeats of a stencil on a fabric in a straight line or all over the surface of any other object, triangular holes are cut on the two diagonally opposite corners of the stencil . When the stencil is placed at the starting position to make a print on the starting point of the repeating pattern, the holes cut at the corners are also marked with a chalk at that place on the cloth. After printing, the stencil is placed at the next position according to the chalk marks of the first position.The whole process is repeated for the consecutive prints. If the motifs are placed quite close to one another , It is advisable to print alternate ones, coming back to fill in the space when these first prints are dr If your project requires repeating the same stencil in different colours, the registration of colour will be done by first placing the stencil for first colour to be printed in its correct position on the fabric. In the same manner, repeat the same process for the next colour.

Negative stencil designs

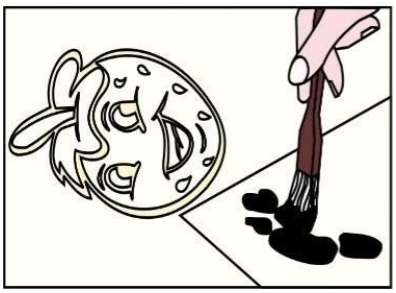
Till now only positive stencil printing has been considered. Try out the negative stencil idea too where you apply colour around the shape, leaving the shape itself with the colour of the fabric. You can use the pieces cut from the normal, positive type of stencil as templates to develop an interesting design. Use a weight or double sided tape to hold the template in position on the fabric when you print.

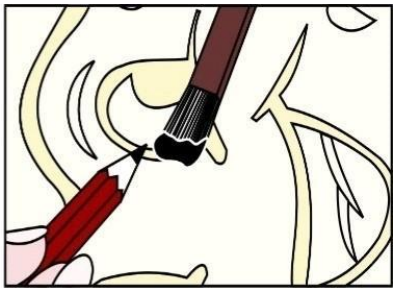
Instead of cutting out a shape some hard objects can also be used as stencils, e.g. leaves or petals of flowers. Masking tapes themselves can also be used strategically placed adjacent to create unique printed patterns .

Precautions to be Observed while Printing

One should take care of the following points while printing with a stencil so as to speed up the process of printing and to reduce the printing errors to a great extent.

- Apply the paint with almost a dry brush. Dry it by dabbing it to remove the excessive paint.
- Keep the stencil pressed with free hand while printing .
- Start with the brush or the cotton pad or the sponge at the centre of the painting area first .
- Always apply paint from outside into the middle of each open area .
- When painting near a tie, the tie should be kept pressed with a sharp object such as a pencil .





- Dabbing off extra paints
- Apply paint at the center first
- Hold the tie while printing

# AN INTRODUCTION TO HAND PAINTING

## Introduction

In this lesson, you will be introduced to hand painting, its historical background, and material required for hand painting.

## Definition of Painting

Painting is the practice of applying pigment, suspended in a carrier (medium) and a binding agent (glue), to a surface (support) such as paper, fabric canvas or a wall.

Painting can also be defined as a creation of art, with aesthetic value, made through the application of paint to a surface.

## Historical Background

The history and tradition of hand painting on fabrics goes back thousands of years. Ever since human beings learnt the art of making fabrics through weaving of fibres, Painting is one of the earliest methods of ornamenting fabrics. Techniques that were used to decorate the human body began to be applied to ornament the fabrics also. Two basic methods emerged:

- Colouring (directly drawing an image with colour on the fabric).

Patterning (painting or printing patterns on fabric with the help of the resist technique).

## Material Required

Material required for Hand Painting is not very expensive. The main requirements relate to a good selection of dyes and pigments, some inks and some good quality brushes.

The important materials required for hand painting are listed below:

- Fabric Paints
- Medium – It is used to thin fabric paint.
- Fabric Brushes – Synthetic or nylon brushes in pointed, round and flat tips in various sizes are used.
- Fabric Markers – These broad line markers are good for decorating fabric.

- Glitter Glue – It is useful for ornamenting fabric.
- Board or Frames – Fabric should be stretched on a frame to paint. It must be large enough to fit the design.
- Designs – Can be transferred on fabric through Stencils, Tracings, or drawn free hand.
- Masking Tape – It is used to hold fabric in place on the board. Thumb-pins, large clothes pins or clips are used for this purpose.
- Palette and Mixing tray – It is used to mix and keep colours.
- Apron – Is used to protect clothes.
- Water Containers – Are used for rinsing brushes in clean water.
- Tooth Brushes – Are used for spattering paint on the fabric.
- Spray Bottle – Is used to spray colour on fabric.
- Miscellaneous – Napkins to wipe the brushes, scissors, pencil, iron, etc.
- Fabric – Is required to paint the design on. printed

Fabric brushes Brushes play a very important role in the process of hand painting. So it is important to learn how to choose right brushes. A right brush produces good results. A brush that is too stiff can damage the fibres of the fabric. On the other hand, a brush that is too soft will cause frustration while applying paint.

The most common type of brushes designed for fabrics are synthetic or nylon brushes. These brushes are specifically designed for use on fabric and come in a variety of styles. Fabric brushes are available in flat angles, pointed, rounds, liners and scrubbers.

Flat angles, pointed, rounds and liners are used mainly for brush-on fabric painting. They are used for finer woven or knitted fabrics such as cambric, silk and T- shirt type knits.You can buy paint brushes from stationers, art suppliers etc. Try to find a shop that offers a good selection, so you can compare different types, and pick one that suits both your requirement and budget.

Cheap brushes are made from artificial hair like nylon fibres. Brushes made from a hair/nylon mix, cost a little more. The best brushes, however, are real animal hair brushes, such as, sable, camel or squirrel. These brushes are also the most

expensive. When you have found a range you like, pick out a few brushes of the size you want and compare them.

Look for a brush that comes to a nice point, without any stray hairs coming out at unwanted angles. Good quality brushes are usually protected by a clear plastic guard. If you remove this guard to inspect the quality, remember to replace it carefully afterwards. It is worth spending a bit more on good quality brushes, since they are easier to paint with. You must, however, look after them carefully; then they will last a long time.

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Caring for your brushes

The following are some tips for care and long life of brushes.

- When you are painting, do not dip the brush completely into the paint. It results in paint wastage and also old paint will clog up and spoil the base of the brush.
- Use the right brush for the job – if you are painting a large area of flat colour, do not use the detail brush (small ize).
- Either set aside specific brushes for certain tasks, or keep a selection of old/cheap brushes for rough tasks. When you've finished painting, clean your brushes in clean water and store them safe.

- Do not leave the brush in water with the brush side dipped in water for long, else the tip gets spoilt.
- Always store the brushes either in a cloth case as illustrated above or with the brush side up; possibly with the plastic guard on.
- Even while intermissions during painting sessions, it is desirable to keep the brushes with the brush side up in the container.
- While painting, pressure should not be applied on the brush tip, lest it would spoil the tip.

## Fabric Preparation

Always pre-wash the fabric you intend to paint on, to remove any dirt, starch or grease from the material. These agents do not allow the paint to penetrate into the fabric or become permanent.

Always iron the fabric to remove any wrinkles before transferring the design. It isdesirable to stretch and fix the fabric to a frame before starting to paint.

## Transferring Design on fabric

Design can be transferred on the fabric in a variety of ways. Some of the most commonly used methods are:

- Stenciling
- Tracing
- Free hand drawing

Stenciling- A method of applying a design by brushing or sponging paint through a cut-out overlay placed on the surface .Stenciling the design on the fabric is an easy way of achieving beautiful designs. After stenciling the design is painted with the help of brushes or sponges.

Tracing -In this method, a design is first traced on a tracing sheet .Then with the help of a carbon paper the design is transferred onto a fabric.Dark fabrics are a little more difficult to transfer patterns on. You can use red or white carbon to trace on them.

Free hand drawing- You can also draw designs directly onto the fabric through the free hand method .For this, however, you must have a steady and practiced hand. After a design has been transferred onto the fabric, the fabric will need to be positioned on a painting board. The surface of the painting board should be smooth and non- porous. The painting board should be larger than the design area to prevent having to move the fabric around. The fabric is required to be secured to the board with the help of clips or masking tape.

## Tips for Paint Preparation

Water can also be used the medium for thinning the paint instead of chemical thinner. Paint consistency varies with the variety of fabrics. The paint should not be very thin i.e., dilute while painting on synthetic fabrics,. It is desirable to apply more than two coats. In case of cotton the consistency of the paint really does not matter much. The paint tends to thicken during painting, to avoid this keep wetting the brush frequently and also add few drops of water and mix the paint.

## Difference between Dyeing and Printing

Dyeing -Dyeing is the process by which dye or pigment is applied onto textile materials like fiber, yarn, fabric. Dye molecules are fixed to the substrate by adsorption, sorption and diffusion. The bond may be weak or strong depending on the dye. Dyes should be solubilized and then applied to the substrate. Different fibers are dyed with different dyes. Acid, basic, reactive, vat, sulphur, azoic dyes are different dyes. Different dyes are applied to different substrate.

Printing-Printing can be said to be as localized dyeing. In this process, dyes and pigments are applied in the substrate in a given pattern. Printing can be done using different method like block printing, roller printing, screen printing, rotary printing etc. Printing can be done in different styles like discharge style, resist style, direct style of printing.

TIE AND DYE

The oldest form of designing with colour is resist dyeing. The resist material could be thread, pieces of fabric, or substances such as clay and wax that offer physical resistance. The most common method of resist is tying with thread. Tie and dye is the name of a technique in which the areas to be in pattern are resisted by means of tightly wound thread. When dipped into dye, the resisted areas retain the original colour of the ground. Bandhani, chunari, laheria are some of the names of materials in which the pattern is created by tie-dyeing the fabric after it is woven. A typical tie and dye design is *bandhej* where the patterns comprise of innumerable dots; another is the *laheria* type where the pattern is in the form of diagonal stripes. Gujarat and Rajasthan are the homes of this type of fabrics.

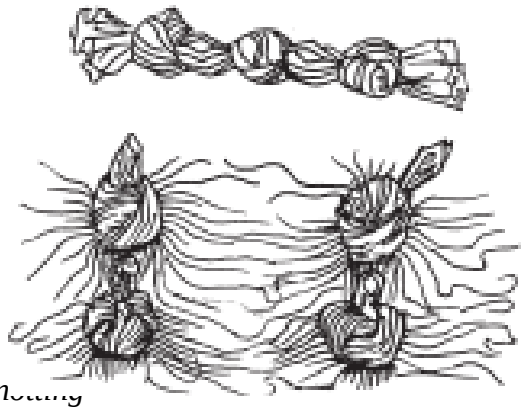
Purpose

1. To learn the concept of tie and dye

2. To learn the process of tie and dye through various techniques Conducting the Practical

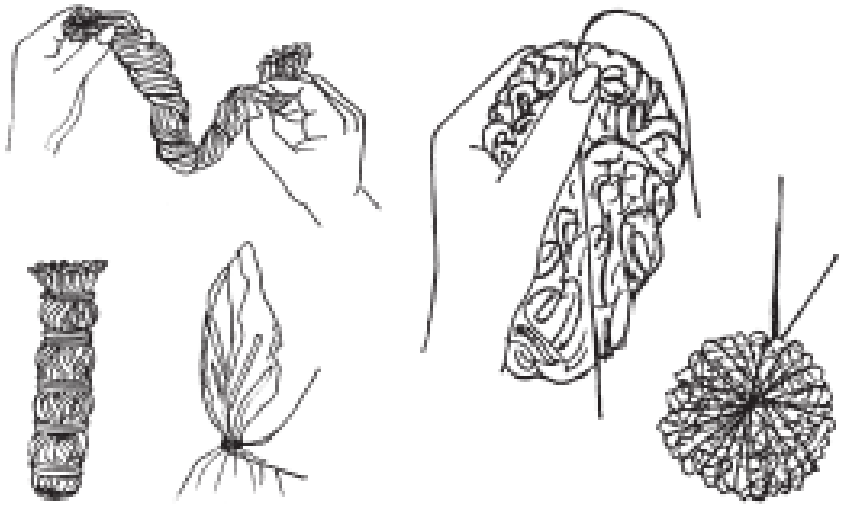
As a modern day craft, numerous techniques of tying are employed to get variegated effects. Resist can be offered by using threads of different thicknesses, or by the material itself through knotting, crumpling or folding and then tying over it. Some of the techniques are described below:

*Knotting:* It is one of the easiest and quickest ways of producing the design. Knots can be tied in several ways depending on the size, shape and grain of the fabric. The best results are achieved on fine fabric. It creates shaded circular patterns.



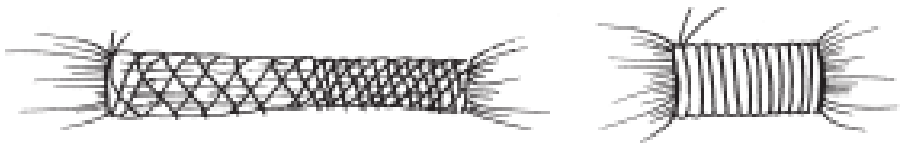
*: Knotting*

Marbling: This effect can be achieved in two ways. The material is gathered and turned into a ball and tied in all directions until it becomes solid mass. The fabric can also be twisted and coiled length wise and tied to create marbling effect. This method gives variegated and irregular cloud like effects. It is thereafter generally dyed in light colours, and may be repeated in two or more colours. It helps to create a multicoloured background, which can later be tie-dyed in a more definite pattern.



Making a Ball and Coiling

Binding*:* Certain parts of fabric are bound very tightly with thread before dyeing. Binding can be done in the form of a dot, a band, line, criss-cross or spiral. Designs are like stripes – straight or diagonal *(lehria)*, circles or spots *(bandhej)*.

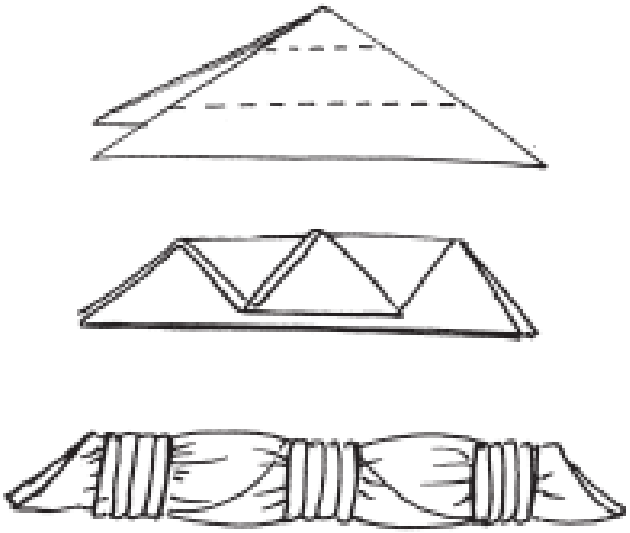


Binding

Tritik or sewing: The fabric is sewn with a needle using simple tacking stitches along a definite pattern. A strong thread is used with a large knot in the beginning. It is pulled so that cloth is gathered closely; and finished with a knot again to hold the gathers

together. The patterns created are pleasing bands of dotted textures of various shapes.

Folding: The fabric is folded in different forms, like pleats, squares, triangles. To hold the folds together binding or clipping is done using thread or clips respectively. The pattern created is in the form of symmetrical stripes, bands, squares etc. Best effects are achieved on thick materials because the fabric itself forms the resist. These patterns can be later used as background for block printing and embroidery.



DIFFERENCE BETWEEN DYEING AND PRINTING

| Dyeing | Printing |
|---|---|
| 1. By the dyeing process, dyes are applied on the whole fabric equally. | 1. By the printing process, dyes are applied on the fabric localizedly to produce desired design. |
| 2. Fabric, yarn and fibers are dyed by dyeing. | 2. Generally printing is done on fabric. |
| 3. In a dyeing process, dyes are applied on the both sides of the fabric. | 3. Dyes are applied on olnly one side of the fabric. |
| 4. No precise design is required for dyeing. | 4. Design is must for printing. |
| 5. In a dyeing process, only one dye is used. | 5. In a printing process, one or more dye is used. |

| | |
|---|---|
| 6. Precise temperature is required for dyeing. | 6. In printing, it is not necessary to maintain precise temperature. |
| 7. Thickener is not required for dyeing. | 7. Thickener is must for printing paste preparation. |
| 8. The density of dye solution is less than the density of printing paste. | 8. In printing, the density of printing paste is higher than dye solution density. |
| 9. Huge amount of water is required for dyeing. | 9. Small amount of water is required for printing. |
| 10. Steaming or curing is not necessary for dyeing. | 10. Steaming or curing is must for printing to fix the dyes or pigments on the surface of the fabric. |
| 11. Dyeing is comparatively cheaper than printing. | 11. Printing is costly than dyeing. |
| 12. Dyed fabrics are soft. | 12. Printed fabrics are hard and harsh. |

Difference between Hand embroidery and Machine embroidery

Hand embroidery begins with a piece of fabric tightly stretched over a wood or plastic hoop. From the time the first stitch is made, the crafter will make decisions about the color of thread and the type of stitch used. As the work of art unfolds, they may change their mind about which choices will produce the best results.

Hand stitching results in a unique piece of work every time it is created. Even if the exact pattern and thread colors are replicated, there will be subtle differences in the way the stitches are made and the area where colors and shading are used.

The type of thread used for hand embroidery differs from that used in embroidery machines too. Hand embroidery thread is stranded and comes in silk, cotton, or wool. The strands may be separated to make some areas flatter or more delicate, or combined for bulkier areas. This process gives the embroidery more texture and distinction between various areas.

- Machine Embroidery

The process of machine embroidery is much more exact and uniform than that of hand embroidery. Although the crafter can choose from thousands of designs and determine the thread colors they want to use, there is no room for editing along the way. Pre- designed patterns are loaded into the machine and the exact same pattern is produced

every time. Machine embroidery is like running papers through a copy machine; each piece is identical to the original.

The thread used in an embroidery machine is heavier than what is used for hand embroidery and it is typically made of polyester, metallics, or rayon. This thread is not stranded and cannot be separated to change the texture of any part of the embroidery. The same thickness will occur throughout the pattern, giving it a flatter appearance.

Which Is Best?

Hand embroidery and machine embroidery are two very distinct methods of stitching and each has its purpose. It just depends on your end-goal.

A hand embroidered work is more artistic and personal, making it the ideal way to create a special heirloom or a source of pride for the embroiderer. The process requires an investment of time and heart to include the details that will make the embroidery stand out. Depending on the skills of the person with the needle, hand embroidery can result in a lifelike piece of art that will make a unique display to be enjoyed by all.

Machine embroidery, on the other hand, produces more professional looking work in a fraction of the time it takes to do something similar by hand. The broad selection of designs available today provides everything that is needed for personal use and for small businesses as well.

Some home embroidery businesses focus on monograms while others might embroider men's caps. These are all uses that require the professional results of an embroidery machine.

The same is true for sewers who want the versatility that an embroidery machine brings to their craft. They may want to add decorative detailing to home items like placemats or curtains, or add cute animals or cartoon characters to their children's clothes. Even the smallest embroidery detail adds interest and value to all types of everyday items.

If embroidery is a new area of interest for you, your lack of experience doesn't mean that you are limited in your choices. Every person who has become an artist with a needle and thread had to start with their first piece.If you prefer machine embroidery, no previous embroidery experience is required. Today's embroidery machines are virtually decision-free! Once you decide what you want to embroider and in what colors, the machine will do the rest.

Tools USED FOR HAND EMBROIDERY

- Embroidery hoops are used to hold fabric taut while stitching. We use plastic ones for stitching and wooden ones for framing embroideries.
- Different types of thread

Like the selection of fabric, needle and style of design, it is important to learn about the selection of thread used for embroidering a particular design. The factors to keep in mind while selecting a thread are colour, texture,length, thickness and suitability to the final effect of the embroidery pattern. Threads are one of the basic materials needed for embroidery. The most commonly used threads are stranded cotton threads. These threads have mostly six separate strands which can be used together, or separated and used singly or in groups. These threads, often referred to as 'stranded silk' though they are actually mercerised cotton, are lustrous and suitable for most types of embroidery. The benefit of stranded cotton thread is that the strands can be separated and recombined in any number to achieve differing thickness and effects. Sometimes, different brands offer different numbers to the thread. The embroiderer can select the threads according to his/her requirements. Wonderful effects can be achieved by using different threads, like pearl cotton, silk threads, metallic thread, fine woolthread, and viscose rayon thread—the list is endless.

Metallic threads-This category of threads is an innovation in embroidery work. The use of metallic threads adds shine and glamour to the embroidery work. These are available in the market in colours like gold, silver, platinum, copper and antique or aged versions. Metallic threads are quite durable and require less care.

Satin and rayon threads-It is a term used for synthetic threads which give a brighter and shimmery look in the embroidery. These threads have a satin-like shine and are usually packaged as floss that can be separated in different ply.

Overdyed threads-These are shaded threads. These threads have more than one colour in a single strand. They can be hand dyed or mass produced in cotton or silk embroidery floss.These threads are available in different weights. Using these overdyed threads gives the embroidery pattern a totally different look because of changes of colour at short intervals.

Wool threads -These are used in some special embroidery forms where a thick woollen look is required in the embroidery. These threads are available in a variety of weights and colours. These threads are most commonly used in counted thread work.

Novelty threads -These include a wide range of styles, textures and material. Novelty threads can be fuzzy, metallic textured, leather, plastic, etc. They are used to give the embroidery pattern a special look.

*Pure silk sewing thread*-Embroidering on fine fabrics such as silk, a silk sewing thread can be used for fine embroidery such as faggoting, pin stitch and hem stitch, etc.Many other types of threads with special characteristics are available in the market with different brand names. These threads can be selected according to the suitability of the fabric, design, liking of the user, etc. Now, we are almost set for starting embroidering. We have even read the about threads now. Let us see how we can hold all these material together for a neat outcome.

3.Different types of fabric -Fabric is used to make garments and home furnishing items. Most fabrics are made from yarns, but the basic component of textile fabrics is fibre. These may be natural fibres, like wool, linen, cotton, silk, etc., or synthetic fibres, like acrylic, polyester, acetate, etc., Fabric is formed using a variety of techniques, like weaving, knitting, felting and netting (the four basic ways of constructing fabric). Mostly, natural fibres (with the exception of silk) are short and are called staples. The long continuous strands of silk and man-made fibre are called filaments. These staple and filament lengths are then twisted into yarns. The appearance and durability of the yarn is affected by the degree of twist. Gently twisted yarns are suitable for napped fabrics which are soft and rather weak. Tightly twisted yarns are used for smooth fabrics such as gabardine. In general, the tighter the twist, the smoother and the stronger would be the yarns.

Following are the fabrics commonly used for hand embroidery:

**(i)** Linen It is a fabric made from natural fibres, like from vegetables or animals and insects like silkworm. It is relatively soft, smooth, lustrous and is very strong textured. It is used for shirts, safari suits, kurtas, kurtis, and children’s wear. It is also used for aprons, bags, upholstery and many home furnishing items.

**(ii)** Cotton It is a fabric made from cotton which i obtained from the cotton plant. It is soft, smooth and absorbent. Cotton is suitable for garments worn close to the skin to keep the body cool in summers, since it aids air circulation. A large variety of kurti, leenga-choli, saree, salwar-suit, shirt, kurta-pyjama, jackets, safari suit, trousers and children's clothes are made of cotton, and decorated by hand embroidery. It is also used for home furnishings like bed sheets, pillow covers, table cloths, table runners, curtains, etc. Cotton is suitablefor embroidery as it is easy to pull a needle and thread through it. When the weave is loose, it is easy to pass the needle with the thread, but when the weave of the fabric is tighter, it will be difficult or even painful for the fingers of the embroiderer while pulling the needle and thread through. The weave of the medium-to-heavy weight coarsely woven cotton is a little loose, hence making it easy to pull the needle and thread through the fabric.

**(iii)** Crepe It is a light-to-medium weight fine fabric and is used for making flowing garments since it drapes very well. It has crinkled surface due to the high-twist silk yarn or chemicals. This look can also be given by a special weave called the crepe weave. Crepe fabric was originally made using only silk, but nowadays different kind of fabrics, such as chiffon, cotton, and rayon, etc., are commonly used to create crepe fabric. Fur, silk and original leather, blended silk, crepe, linen, chiffon, etc. are being liked and used in the fashion industry. Among the contemporary fabrics, crepe is well- liked by customers and designers. Mostly, crepe has a creased or grain surface that has very small folds or ridges. It can be embroidered, embellished with different designs to create a more ethnic, traditional look for the end product. Different types of crepe include Moroccan crepe, wool crepe, plisse crepe, crepe de Chine and crepe georgette

**(iv)** Satin It is a fabric woven in warp-faced stain weave and has a smooth and shiny surface. Satin is a smooth, delicate and medium-weight fabric. It falls gently down the surface it has been draped on enhancing the natural shape of the surface. It has a lot of shine, which makes it uitable for use as garments as well as home furnishing. Because of its gentle shine and draping qualities, satin is ostly used for evening wear, bridal wear and party wear. Even though most embroidery stitches ca be easily done on satin, special care needs to be taken while fixing the frame. Because of its delicate

and slippery nature, it's very easy to damage the cloth or the embroidery while putting the frame.
**(v)** Velvet It is a medium-weight, mostly silk or synthetic filament yarn fabric with a cotton backing. It has a short, soft, thick warp pile surface that stands up vertically. There are various varieties of velvet fabric differing in their weight. Velvet is a type of woven and tufted fabric. In velvet, the cut thread fibres are evenly distributed over the surface, with a short and very dense pile weave which gives it a unique and lustrous feel. Velvet can be made from synthetic or natural fibres. Velvet's nap (the layer of fibre ends raised from the ground weave of the fabric) gets damaged when pressure is applied on it. An embroidery frame can damage its delicate surface, so velvet is not framed. Embroidery designs with complete filled areas and a filling stitch work show the best on velvet. Running stitches and narrow satin columns will sink into the velvet's pile, so they should be avoided Velvet is used for making evening wear. It is also used for home furnishing.
**(vi)** Silk The strength, lustre and softness of silk makes it the most attractive textile. Silk fibre is considered to be the perfect natural substance in all respects for yarn making. Silk is the longest of all natural fibres and is very smooth. It is said to be the most lavish, lustrous and rich fabric. Silk is one of the most popular fabrics for designer party wear because of its rich look. It is soft and comfortable, hence suitable for draping. It is also lustrous and luxurious. The embroidery on silk is mostly done with silk threads.
**(vii)** Gabardine It is a twill-weave fabric made of a variety of natural and synthetic fibres. It is a medium-weight fabric made of fine yarns. Gabardine is commonly used for making garments, such as coats, jackets, skirts and trousers, due to its nature of holding a steady crease. Even though it is thick and stiffer than materials described earlier, it is comfortable and soft to wear.
**(viii)** Georgette This fabric is a thin, transparent, lightweight fabric and is mainly made of highly twisted silk yarns. The twisted yarns are used in both warp and weft directions. Like silk and satin, this also has a soft feel and drape well.
**(ix)** Jean It is a durable cotton fabric. It is made of fine cotton yarn in twill weave. It is mainly used for making trousers, skirts, jackets and shirts, etc. *Note:* The term jean

here refers to the fabric while popularly ‘jeans’ refer to the trouser-like garment made of denim fabric.

**(x)** Organdy It is a thin, light and transparent cotton fabric in plain weave with a stiff finish. It is made from good quality combed spun yarns. The yarn is made from long staple cotton and is spun with many twists. This, along with the finishing process, produces its characteristics of transparency and crispness. Its sheerness and crispness are the result of an acid finish given to lawn fabric in gray state. It is used for making saree, kurtis, tops, and other children’s garments. This fabric is mostly used for summer and evening wear.

**(xi)** Poplin It is a fine and tightly woven cotton fabric of plain weave. t is the fabric with fine cross-ribs created by finer warp yarns and heavy weft yarns. Poplin is mainly used for making shirts, kurtis and children’s garments. Many times, it is used for home furnishing items also. ‘

**(xii)** Rubia It is a thin muslin, slightly thicker than the voile fabric. It is always made of ply yarns in a yarn count of 150–200s constructed with plain-weave. It is used for making blouses, kurtis and other dress material.

**(xiii)** Chiffon It is a lightweight, sheer, shiny, and plain-weave fabric. It is made from highly twisted yarns. It has good drape and is used for making evening wear and party weargarments.

**(xiv)** Cambric It is a closely woven plain-weave cotton fabric which is finished with a little gloss on one side. It is a medium weight fabric. It is used mainly for making children’s and adult garments. It is thicker than rubia.

**(xv)** Voile It is a sheer, transparent, soft, lightweight, plain-weave fabric. It is made of highly twisted spun yarns. It is used for making children’s wear, blouses and dupattas, turbans and sarees.

4. Different types of needle The most essential tool without which hand embroideryis not possible is the needle. It has three parts, namely the eye, shaft and point. Needles are avilable in different thickness, length, size of eye, sharpness and shape of point.The number indicates the size of the needle— the higher the number, the finer would be the needle. Different brands of needles some time offer different numbers to

the needles. Mostly, embroidery needles are available in assortment packages. For example, an embroiderer can purchase different types of needles in packages of assorted sizes 1– 5, 3–9 and 5–10, etc., to have a variety of sizes available while embroidering. The selection of the size of the needle is done based on the weight or thickness of the material, the required fineness of the embroidery and the kind of thread to be used, e.g., if silk thread is being usedon chiffon or silk-like soft material,

(i) *Crewel needle*-It is the basic embroidery needle most often used for hand embroidery. They are sometimes also known as embroidery needles. Except for its long slender eye, it does not differ materially from the sewing needle in shape, and it comes in the same size numbers. For embroidery, crewels should be used unless some other kind of needle is specified. The long eye helps inserting and accommodating embroidery threads easily. The sharp tip of the needle helps the needle pierce the tightly woven fabrics more easily. Crewel needles come in different sizes but most popular sizes to embroider are size 7 and 9. (ii) *Tapestry needle* - It is very useful for wools, matty and open weavefabrics. It enables the embroiderer to avoid the splitting of threads. This needle's rounded point allows it to slip between the threads of the materials rather than through them. Tapestry needle point is blunt and it has a large eye; it is inserted between the threads of the fabric without piercing them. These needles are commonly used in counted thread work such as cross stitch, pulled and drawn thread work, and lacing on composite stitches. Tapestry needle has a shorter shaft than a crewel needle but it has a much longer eye, which is slightly larger than the shaft. Due to the open holes in the weave of the fabric, even the blunt tip can pierce through it easily. Tapestry needles are the most appropriate tool for any type of stitch that involves lacing for surface embroidery. The blunt tip of the needle prevents it from snagging other stitches on the fabric. Tapestry needles are available in the local market in different sizes mainly from 13 to 28, with 13 being the largest and 28 being very fine.

(iii) Milliner needle This is also called a straw needle. The milliner needle has a shorter, almost round eye. It has very long shaft and a sharp tip. The eye and the shaft on a milliner needle are the same size, which makes these needles appropriate for working any wrapped stitches such as bullion knot, French knots, etc. They are also used for

pleating and creating fancy stitches. In bullion knots and French knots, the shaft and the eye of the needle are of the same size, making it easy to pull the milliner needle through the wraps and make the knots on the fabric. It makes these wrap stitches so easy to work and the stitch comes out looking neat.

(iv) Chenille needle This is a big needle with a long thin eye and a sharp point used for thick threads. This needle is appropriate for stem stitches, lazy-daisy stitches, straight stitches, mirror work, etc. It is also useful for tacking couched threads to the back of the fabric.

Punch Needle Another type of embroidery is needle punching, which involves looping ribbon, floss, or yarn through the fabric to create a pattern. While not the typical embroidery that many people picture when they think of this handicraft, needle punching is growing in popularity.

There are arguments that needle punching began either in Russia or ancient Egypt. These needles have a hollow shaft, as well as a depth gauge. The pointed side of the needle has the eye and is inserted into the fabric to put some of the thread into the pattern. (v) Sharp needle It is mainly used as a sewing needle and has a small eye. It may also be used for embroidery.

(vi) Between needle It is same as the sharp needle, but shorter.

(vii) Beading needle It is a long, very fine needle with a tiny eye for small beads.

- Embroidery hoop or frame - This tool is required to hold and stretch the fabric to desired firmness and tightness while doing embroidery. A frame is a set of two rings; each ring fits inside each other, so that the material placed between them is held firmly and the fabric surface becomes tight and smooth to embroider. The most common type of frame for hand embroidery is the ring frame. It is always advisable to use a frame or hoop while doing embroidery to give the embroidery pattern a beautiful, neat and finished look. These frames are made of wood, plastic or metal and are easily available in the market in different sizes. Their size is measured by diameter, mostly ranging fromc 7.5–30 cm (3–12 inches) they are suitable for doing embroidery on small designs. The hoop usually has a nut and a bolt for tightening of the fabric between the two rings of the frame. While stretching the fabric on the

frame, it should be kept in mind that unnecessary tightening by the nut bolt can damage the fabric. When embroidery is to be repeated on different parts of the fabric, the frame may be fixed on different parts of the fabric according to the placement of the embroidery design. When embroidery is to be done on a large design, an adda (a big adjustable frame using mostly wooden bars) may be used. Plastic frame is a good option for embroidery work, because it is durable and it doesn't stain the fabric. Many times, metallic frame stains the fabric because of the rusting. Wooden frames may draw the yarns of the fabric, hence damage the fabric or the embroidered pattern. Sometimes when the surface of the wooden frame is not smooth, fine wooden strands may be pricked in the fingers of the embroiderer.Other materials used for embroidery. 6.Needle threader It is a small handy tool with a wire loop to thread the needle. It is very helpful for those who have difficulty in threading needles. Fabric glue This kind of glue is used only for fabrics and does not damage it. It is used to attach beads, sequins, pearls or different decorative material on the fabric. 7.Seam ripper-It is a small tool to open or unsew the stitches in case of faulty stitches. 8.Thimble- It is used to protect the fingers from getting pierced or discoloured during embroidery. Metal, rubber and plastic thimbles may be available in the market. The embroiderer must take care of his/her hands and use thimble while doing hand embroidery. Thimbles can be worn in any of the fingers or the thumb of the hand. Mostly, it is worn in the index or middle finger which holds the needle. It must be comfortable and should be light in weight. It is used to push the needle to the fabric painlessly without harming the finger.

9.Ruler-A simple ruler of 6 or 12 inches may be used to measure the accuracy of embroidery as per the motif and design whenever it is required. Wooden, plastic and metallic rulers are available in the market. 10.Trimming materials-These are used to decorate the embroidered patterns made on any fabric, sample or garment. They may be selected according to the embroidery design, type of fabric, end use of the product or material, liking of the user, etc. Different variety of trimming materials such as stones, mirrors, gota patti, beads, dori, etc., are available in the market. The embroiderer can select them according to his/her requirement.

11.Scissors for hand embroidery- Small scissors of a 3–5 inch length, are mostly used by the hand embroiderer to cut the threads, edges of the fabric, etc. Mostly, scissors with metallic or plastic handles are available in the market. The embroiderer can use it according to his/her comfort or requirement. It is advisable to use sharp scissors of stainless steel. Handle the scissors carefully to avoid any accident. 13.Micro-tip scissors -It is a sharp tip pointed small scissor, mainly used to cut fine threads very near to the embroidery pattern.
14.Pinking shears -These have blades which give a zigzag edge to the fabric. It is used to cut the fabric to prevent fabric edges from unravelling.

15Applique scissors Also sometimes called “duckbill scissors” because of their shape and the way t that they look, these scissors have a very specific job of removing extra fabric. If you are going to be cutting around your work when you are finished, then you will want a pair of these scissors, as they push the fabric away from the cutting edge so that you do not accidentally clip your work and make a mistake. You will have a very clear cutting path when you use these scissors and you will be able to cut incredibly close to your stitches without having to worry about whether or not you are going to make a mistake. Embroidery designs The embroiderer can select the design according to his/her requirement. Designs may be taken from the catalogue, Internet, magazines, etc.

16.NEEDLE THREADER -A needle threader is a very useful gadget for threading difficult threads through the eye of a needle. These often come free in packs of assorted sharps needles so check your sewing supplies before you go out and purchase one. Needle threaders have silver round heads that look like a coin. These simple cheap ones work just as well as more expensive versions.If you have never used a needle threader before you are in for a treat! Read my article on how to use a needle HYPERLINK "https://blog.treasurie.com/how-to-use-a-needle- threader/"threader. 17. TRACING- There are many options to trace or transfer the pattern onto your fabric. Tracing paper, tracing wheels, transfers, lightboxes, water-soluble pens and iron-on transfers are different options to try out and find the one best suited to you. If you are looking for a free option, use a brightly

lit window. Hold the paper with the pattern up or tape it in place on the glass. Then hold the fabric over the paper and start tracing.

18 PENS - Water-soluble pencils, tailor's chalk, pens and fabric drawing inks are different options for the drawing of the pattern.

19.- Pressing your work regularly is an important part of keeping the stitching flat and not puckering. Many fabrics become wrinkled from the over handling during embroidery or from the edges of the embroidery hoop.Be careful with using steam in case any of the colors of the threads run on the fabric. Red always seems to be the one color most likely to run

20.INTERFACING - Softer delicate fabrics are easier to work with if they have a backing. Thin interfacing or special soluble interfacing is often used with embroidery. 21.PINS - Top-quality stainless steel pins with no rust are important and of course a pin cushion to store them.

22. Light tablets are my preferred method of transferring embroidery patterns. They allow for much more accurate drawing than you get from a sunny window or homemade light box.

23.Pin Cushions Chances are very good that you will have a number of different needles that you will be using when working on an embroidery project, and to keep them all safe and in one location you will want to have a pin cushion. Needles are rather small and if they fall on the floor or in between the couch cushions they can be very difficult to retrieve, so it's a good idea to take steps to ensure that you always know where your needles are.Pin cushions come with a number of different types of fillings, so you need to make sure that you do your research to find the material that is right for you. If you opt for wool or cotton, then your pin cushion will be a little heavier, and the lanolin in the wool may help to keep your needles shiny and smooth. polyester is another option, but the pin cushion will be very light and easy to knock off of your table. Some companies make pin cushions that are filled with sand or a powder, and while these are nice and heavy, if they are damaged they can make a real mess.

Important tips for good embroidery work-

- Before starting embroidery work, wash hands with soap so that the fabric or the material used remains as clean as new.
- Ensure that the embroidery hoop (ring or frame) is fitted properly before starting the embroidery work. For holding the fabric tight and stretched, wrap a ribbon around the inner ring, if the outer ring is loose.
- The thread should not be very long (i.e. not more than 17 inches). A very long thread pulled too often through the fabric tends to coil or fray towards the end.

  Avoid using a knot when starting or ending an embroidery thread. Bring the needle straight up and start the embroidery, holding the thread onthe wrong side of the fabric and hiding it under the working stitches. Remember that it should not be pulled so as to avoid damaging the stitches. The finished embroidery work should be neat and even, on the wrong as well as the right side. Students in the learning stage can make knots while doing embroidery.
- Make the embroidery in a way that the shape of the design is maintained properly. It should be done gently and the working thread should not be pulled too much. Use small scissors to cut the threads.
- Avoid putting pressure over the fabric, otherwise it may become loose.

The main principles that influence embroidery work

- Design of the embroidery
- Placement and purpose of the embroidered project
- Materials and equipment used for embroidery
- Fabric selection
- Colour scheme
- Finishes
- Neatness

All

Embroidery starts with a design. Either as a freehand drawing of a design or transferring a copy of the design you want from a sheet of paper to the fabric by a variety of means ( learn more about the different methods used to transfer embroidery designs to fabric here). You can plan the design on paper and then develop on it on the fabric or start the design from the fabric itself. Find some inspirations to make your own embroidery design HYPERLINK "https://sewguide.com/design-embroidery/"here . You can copy designs from easily available embroidery design works but developing your own design is wonderful. Imagine having a work of art which no one else has conceived and conceptualised other than you. The most popular subjects for embroidery are from nature- plants and flowers, fruit, vegetables, sceneries of nature . Learn more details on designing embroidery- 10 sources of inspiration; how you can convert a favourite photo into an embroidery work here. Simple geometrical forms like circles squares can also form easy to do designs. Border designs are also very popular. They can be designed on their own or along with other motifs. You can draw inspiration from traditional embroidery patterns and adapt them to suit your style with simple changes and make it your own. This way, those long forgotten work stays alive

**1.** Design (as product)-

Design refers to any article of creative art; formed by the assembly of elements as per the guidelines given by different principles. The product may be two dimensional or three dimensional; creating impression, expression or symbolism. Thus the aims fulfilled through the creation of design (as product) are as follows:

- order; resulting in arrangement and creating a structure
- beauty; resulting in improved appearance and interpretation of idea characteristics Design as product is thus creation of man i.e., is manmade in nature. It can be classified into two types depending of the type of stimulation it produces. The stimulation produced by the design as product can be:
- Behavioral; include those that affect the perceived behavior of the person rather than the physical self. The garments as behavioral products are political,

economic, social, religious, communication and cultural in nature where instead of stimulation of the physical .

- Sensory; include those that are perceived or felt by the body senses like sight, sound, taste, touch and smell. The products, garments and accessories, create sensation by stimulation of senses during use and when it is observed . The garments are worn next to the skin so they experienced from inside by the wearer himself and from the exterior by both the wearer as well as the observer. The first and foremost stimulation in garments is visual created by the colour followed by line, shape and texture; touch sensation is perceived from the texture of almost all textiles; sound is also experienced in case of certain fabrics during movement (as soft swoop of satin, the rustle of taffeta, the rubbing of corduroy, the crackling of leather, or the clatter of beads) and the smell in few like the fragrance of sandalwood beads but the sense of taste is not inflicted by the garments at all.

- senses, the psychological components are affected. The garments serve as a media to communicate ones personality, to symbolize ones affiliation to an institution, to convey ones social and economic status and to convey religious thoughts and political inclination .

  Thus the garments and accessories worn by the individuals have the features of both, the sensory and behavioral designs i.e., are perceived through the senses and behavior of the person. The creation of clothing as design product is also affected by different factors as follows:

- Purpose; depends upon individuals' needs and preferences
- Resources; the materials that will compose the garment
- Technology; the methods or techniques that will be used to construct the garment
- Approach; the conformity of the garment to the conditions (social, cultural, and economic) and the individual (behavioral changes)

**2.** Placement and purpose of the embroidered project -First you embroider a design on a piece of fabric and then decide to use it for something – is that what you do?. That is a wrong way to go about it.. You should do the embroidery after

deciding on the purpose of the project and where the embroidery unit will be placed. The design should be appropriate for the scale of the project. Simple designs may work better in some projects than complicated intricate designs. The proportion of the design is very important and so are the placement of design units in relation to the other like the distance between units. For an upholstery fabric, you may want an elaborate intricate design but that may not look good on a garment. So this should be taken care of at the design stage. For sleeves you need 2 mirror image designs in exactly the same positions – this has to be planned after the pattern of the sleeve is marked but before the fabric is cut. Appropriate placement and distribution of the design is paramount in embroidery – imagine the embroidery in your tunic placed just over your bust level on both sides – I would not want that exactly placed there, however beautiful the design is. But I have seen it done and it can look really awkward

**3.** Materials and equipment used for embroidery-

The basic materials used for embroidery are the fabric, a frame and thread to do the work. But with more tools, you can do more. Embroidery hoop to hold the fabric, pencil and other marking tools different type of needles appropriate for the fabric and the embroidery concerned, cutting tools like scissors, rulers are all things you will need as you turn from a beginner to a seasoned embroider. Specialised equipment can make your job easier. To do complicated work like applique you can do a better job with the applique scissors; ari work needle can easily do chain stitch embroidery work far better and faster than the ordinary needle; you can make small holes with a stiletto for broderie anglaise work to make eyelets. Different kinds of threads are used to do embroidery stitches like the common embroidery thread with 6 strands or Perle cotton thread, or metallic thread or even wool thread. Ribbon embroidery work is a study on its own and requires ribbon in many colours. Each thread departs their own look and change the result of the work .

4..Fabric selection -The type of fabric used, it’s surface texture, the prints on the fabric are all important aspects in the final look of the embroidery. For eg., A chequered fabric is used to do chicken scratch embroidery. That type of embroidery would not look as good on any other type of print. Cross stitch is done on more loosely woven

fabric. You need an even weave fabric for counted satin stitch and other counted stitches like that of pattern darning or black work. The printed fabric like gingham, striped fabrics or huckaback, are all popularly used in embroidery for their wonderful designs or weaves. Canvas work is done on plastic canvas with open holes – the thread fully covers the canvas in vibrant patterns. The shadow work is best when done on transparent sheer fabrics For some embroidery you need same thickness for the weft and warp threads so these may not be successful when done on some fabrics like polycotton or satin with different types of weft and warp thread . If you want embroidery on a garment which will be worn and washed at home it had better be a fabric with easy care instructions.Wearability and washability are important. Learn more about the best fabric used for embroidery here. Transparent fabrics or fabric with open weaves like net fabric call for a different treatment and embroidery technique than does fabric like linen. Looped, piled or flocked textured fabric all can be embroidered but they need special treatment and a careful analysis of what suits the fabric texture. 5.Colour scheme -Colour coordination is more important in embroidery than anywhere else. Contrasting colours, monotones, shades of the same colour, an ombre effect – all are popular. But colors are mostly personal. What appeals to you maynot appeal to me. What is popular in one society may not be used in another. A girl may want pink flowers but a boy may see it as childish. There are different theories on finding the right colour combinations – you can check out the popularly used colour combinations and how they are formulated according to the colour wheel here. You should know that colour value of a colour changes when they are placed with other colours – so keep the fabric and the colours you are going to use with the embroidery together and decide on the colour scheme you are going to choose for the embroidery project.

In my personal experience contrasting colours work best in embroidery – for eg a bright red flower amidst green leaves on a light colourd fabric can look striking when compared to the same work done on a black fabric. But then again, this depends on the effect you intend to create with the project. If you want a muted look, tone on tone embroidery can look very elegant ( this is the same colour thread as that of the fabric used for embroidery). Another idea is to use three tones of a single colour—light, medium and dark on fabric with one of the shades of the colour.The number of colours

used can also be a personal choice but restricting the colours to three of four is more prudent for a unified look.

6. Finishing -Embroidery work involves materials and methods which can determine the quality of the final product. Base materials, different raw materials, various techniques to carry out stitches and many other finishing aspects in the end products are important from the point of view of quality. Finishing of the embroidered products is one of the very important aspects of the quality of embroidered finishing process.

*Embroidery finishing process*- After the embroiderer has completed the embroidery work, the finishing needs to be done to improve the quality of their work and give high quality services to the clients.. The finishing process is much more than just folding up the embroidered product or garment, and removing the backing. Following are the main issues which should be sorted and rectified during the finishing process:

**(a)** Thread tails Trim off the thread remains as near to the article as possible, and take care not to cut any locked knots

**(b)** Missing stitches When some stitches are skipped and are found missing, they should be modified. The simplest way for this is to thread a hand-sewing needle with a double strand of embroidery thread matching the base fabric and do a hand satin stitch to fill in the areas, in which the stitches are missing.

**(c)** Stray threads They are the threads that often get trapped during the processing of the stitches on the product or garments. Do not cut the locked knots; these threads should be trimmed as closely to the stitches as possible.

**(d)** Thread loops -If one observes thread loops in the same direction as of the stitches, they should not be trimmed. Instead, the embroiderer can use fingernails to pull the loops to the wrong side or backside of the garment. However, if thread loops are in an opposite direction of the stitches, it is safe to trim them. They should be trimmed as closely to the stitches as possible.

**(e)** Crooked logo or embroidered product Firstly, spread the garment evenly on the trimming table, then if the embroidery appears slightly twisted and wrinkled, steam iron

well on the embroidered area. When the embroidery is hot (because of the effect of ironing), twist and turn your hand and stretch the fabric a bit softly. Repeat this process a number of times. Finally, check the embroidery again.

**(f)** Stains on embroidered product While doing embroidery, the fabric might acquire some stains like oil, dust, etc. There are many ways of removing stains depending on the type of fabric and type of stains. Most of the stains can be removed with a drop of dish soap and water. If this does not work, once the product is dry, you can spray the area with acetone or bleaching agent in case of white fabrics depending upon the type of stains.

**(g)** Damaged embroidered product The damage caused to the product while doing embroidery or hooping should be removed properly. Onemust not finalise and deliver the product to the client with damages as it might will be unfair to both the client and the worker, besides damaging the reputation of the organisation or the business handling the project. The best way to deal with it would be to bring the situation to the attention of the customer and let them decide what they wish to do. They could ask for a replacement, the cost of which could be borne by the organisation or the business.

**(h)** Ironing and packaging After finishing the embroidered product and checking the above points, the product is finally ironed to remove all the creases and wrinkles and folded properly. At the end, the packing is done according to the packing methods followed in that organisation.

7. NEATNESS

a) Before you begin to stitch on a piece that has definite stitching paths, think about where you're going before you start stitching. Here, for example, we have an area with lots of stems and a few leaves. Once you know what colors and stitches you're using (in this case, different greens and stem stitch), look at the design carefully and decide a reasonable stitching path that will allow you to get the most out of the thread you're going to start stitching with. We have to stitch that element in the way that makes the most sense, wasting the least amount of thread on the back, and keeping things neat and tidy at the same time.Each time tackle an element, then, think before you start stitching! Work out a path that makes sense as you

stitch it, that allows you to use your piece of floss to its best advantage, with the least amount of waste on the back, and no big jumps to other unconnected areas.

b) Pay Attention to Beginnings and Ends the beginning and the end of the thread that end up causing the biggest mess on the back. there are a couple tricks that can help you keep the starts and stops a little neater.For the beginning of your threads, the most obvious trick is to avoid a knot on the back of the embroidery.

So, consider beginning your threads without a knot on the back. One way to do this is to use a waste knot on the front of the work, followed by a few tiny backstitches towards the beginning of your line.

## 5.EMBROIDERY PATTERN

Design transferring techniques

Transferring the design to the fabric is the primary task in embroidery. Other than in free machine embroidery, i.e., stitched without designs, it is necessary to transfer the design selected for your stitch onto the fabric. There is a wide range of technique for this; each technique differs with its application. Select a design suitable for your work with respect to the fabric used, design selected, materials available, etc. The basic design transferring technique are traced method, Dress maker's carbon paper method, pricking and pouncing method and tacking/basting method.

Tracing method is most suitable when a light coloured, light weight fabric such as cotton lawn or a fine calico is used. When the design is drawn or printed in dark thick colors, it easily helps to see through it with light colored fabrics. The main advantages of this method are it is less time consuming and requires no other materials except a sharp pencil or a disappearing ink pen and a light box. The light box is used for transferring the design onto the dark fabric. But care must be taken as we may ignore any detail of thse design, resulting in an incomplete imperfect design.

TRACING METHOD

Dress maker's carbon paper method is an important method widely used for transferring the designs. It works in the same way as the stationary carbon, but it tends to be on heavier paper, less likely to tear when pinned. It is available in different colors like blue, white, yellow, etc., hence it is used with both dark and light fabrics.An important precaution to be followed is not to lean or rub the paper while drawing the design, as it may cause smudges of the carbon marking on the fabric.

Pricking and pouncing method is an ancient method of transferring the design onto the fabric. It is one of the methods followed widely throughout the medieval period and before. While now mostly suspended by other more convenient methods, it still works and is very useful for transferring large designs, where the previous methods not suitable. Use fine pouncing powder or similar, though for pale fabrics where this doesn't show up sufficiently, blue powder is available. Special pricking wheels are used for transferring complex designs. Though, it is time consuming it gives, good output and also it is less expensive. It is suitable for all kind of fabrics other than the slippery synthetic fabrics.

Tracking (basting) method is another important transferring technique. Most of the transferring methods require the fabric to be, worked to be marked up directly, whether with a pencil, or disappearing ink pen, carbon paper or pounce powder etc. in all these methods, there are chances to get marks, which we didn't intend on the fabric, whether smudges or lines. But, in basting method, the design is tacked and can be unpicked carefully, if it is still visible, when the embroidery is completed. The main drawback in this method is that it results in a mirror-image on the fabric

Transferring design with stencils A stencil is a cut-out of a design pattern to help make an identical copy of it on another surface, accurately. Stencils are extremely useful for repeat designs, mixing and matching for a unique style. It works on light and medium weight fabrics, like cotton, rayon, linen, silk, and many synthetic blends or mixed fabrics. First of all, select the stencil for the transfer of design and place it on the right side of fabric. Then, use a transfer pencil or pen to trace the design in the cut out areas of the stencil. Stencils of different designs and sizes are available in the market. They are made of different materials like metal, plastic, thick paper, etc. Stencils may be selected according to the requirement of the embroiderer.

Transferring design with heat A common way to transfer images is with heat using design transfer sheet or paper, found in almost any craft or sewing store in the market. A sheet of design, an iron and a pressing cloth is required for tracing the design. Designs can be traced directly if the design is printable on a transfer paper or sheet. To print the design on the fabric, place the fabric face down and tracing sheet on it then heat it with an iron for an appropriate time to transfer the design on the fabric. A transfer paper or sheet of printable design is available in the market with detailed instructions, including time period for heating, on how to transfer the design. The design will transfer to the fabric or garment perhaps in a few seconds.
Transferring design using light or tracing table In this method, an embroidery pattern is transferred, by using light. It allows tracing each line of the design. Both daylight as well as a lightbox can be used. To use daylight, find a bright window that receives a good amount of sunlight. Now tape the design on to the glass of the window and tape the fabric over it as the sunlight shines through the fabric. Now the design can easily be copied by way of tracing on to the fabric. Or else, a lightbox can also be used. A lightbox is a box with a transparent glass on top and a light source (usually a bulb or small tubelight) attached under it. When using a lightbox, the design is put on the glass top of the lightbox and the fabric is taped over it. The light will expose the design and it can be traced and transferred to the fabric easily with the help of an appropriate light shaded pencil so the design is not smudged.

UNIT-4 ELEMENTS OF DESIGN

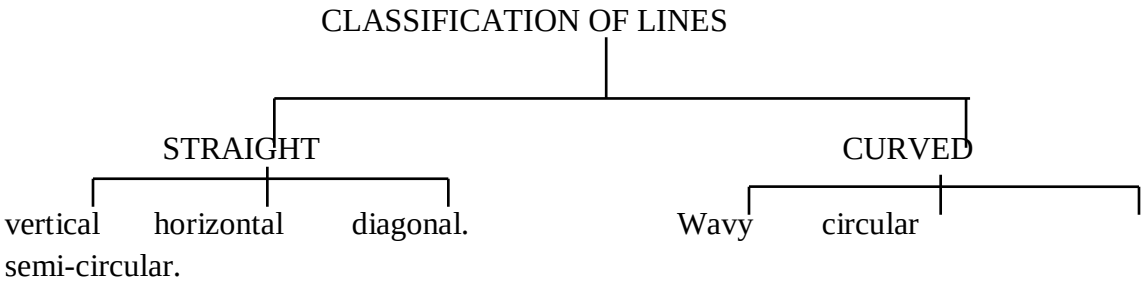
What are Elements of Design?

The elements of design are the basic components used as part of any composition, they are the objects to be arranged, the constituent parts used to create the composition itself and in most situations the elements of design build upon one another, the former element helping to create the latter, and the elements are line, form & shape, space, texture and colour.

LINES:

Lines is drawn by joining any two points .it shows its effect in the design. Lines can be straight or curved. It can be broken, continuous, thick or thin, hard or soft, dark and heavy or very faint and delicate.

Lines in any design suggest movement. Every line of any type has some meaning, it can also be straight or dotted, horizontal or vertical, curved or slanting, Zigzag or crossed or parallel. It all depends on how you draw a line and use its effects in design. Line is the key element of art.



BASIC TYPES OF LINES

1. STRAIGHT LINES
2. CURVED LINES

STRAIGHT lines is essentially just a line, with no curve. Straight lines may be drawn in different direction and are given three names, they are

a) Horizontal lines

b) Vertical lines

c) Diagonal lines.

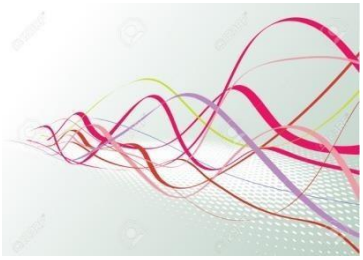
Horizontal lines go side to side, they are straight lines that extend from side to side laying down parallel. They look like they are lying down, at rest, asleep. They suggest calm and quite, a relaxed comfort. Horizontal lines cannot fall over. They are stable and secure.

Vertical lines go up and down, they can also be used to divide space separately images into columns. They are perpendicular to the horizon. Vertical lines are strong and rigid, they can suggest stability, especially when thicker. Vertical lines accentuate height and convey a lack of movement. Which is usually seen as horizontal.

Diagonal line are unbalanced .they are filled with restless and uncontrolled energy. They can appear to be either rising or falling and

convey action and motion. Diagonal lines are more dramatic than either horizontal or vertical lines.

CURVED LINES are softer than straight lines. They sweep and turn gracefully between end points. They are less definite and predictable than straight lines. They bend, they change direction. Curved lines express fluid movements, they can be calm or dynamic depending on how much they curved. Curved lines are drawn in three types, they are wavy, circular, semicircular lines.



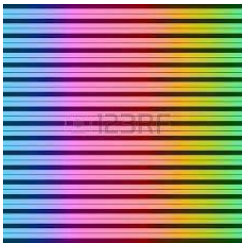
WAVY LINES

Wavy lines are rising or swelling in waves.

EFFECT OF LINES:

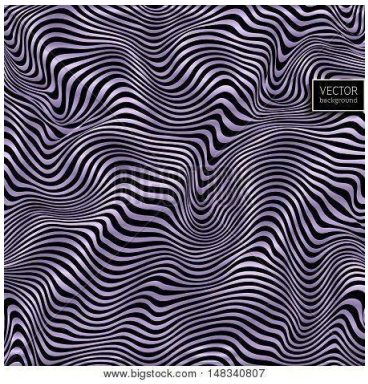
1. Vertical lines: they show rigidity firmness and stability. Uninterrupted vertical lines express stateliness and dignity when vertical. In design they express qualities of alertness.

2. Horizontal lines: It follows the position of things at rest and suggests silence, repose and peace in design it gives a character of quietness and serenity.

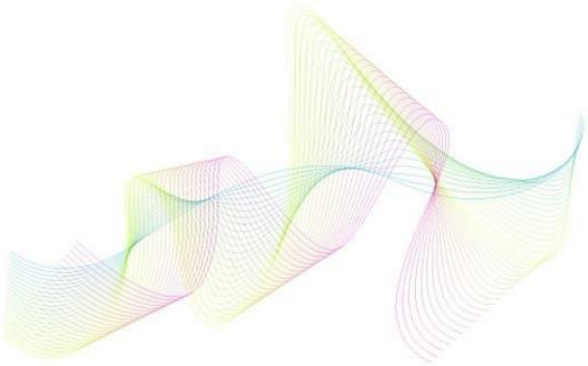


3. Diagonal lines: Active, dynamic diagonal lines assume the character of the direction which they most nearly proximate. As diagonals flatten out, they assume the tranquility of horizontal and consequently have a broadening effect


4. Curved lines: it create different moods and are considered to be more graceful, these lines are the lines of nature flowing soft and graceful.




5. Spiraling curve: Repeated spiraling curve in design show dynamic movement. When used all over the effect is very exhausting and confusing.



6 .Zigzag line: Repeated zigzag lines is as disturbing as chain lightening, their movement and generally very violent and their effect vary with the angle.

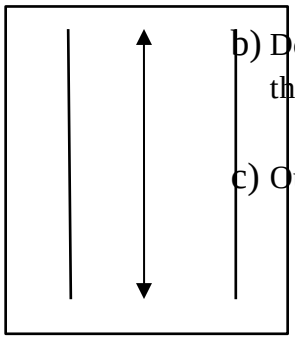
7. V-shape line: It moves like alphabet "V" and so called v-shape line. They express increase in length, if the angle between two lines is kept less and broadness in design if the angle between two lines is more. Inverted V-shape lines gives shape effect in opposite direction.


8.Broken line: In this type of line, vertical and horizontal lines are kept same, but their direction are changed after regular intervals called broken lines in design they are used to show the mixed effects of vertical and horizontal lines.

## OPTICAL ILLUSION BY LINES:

Two identical may look different with two types of arrow on it. One looks longer than the other.

Optical illusion a) straight vertical lines



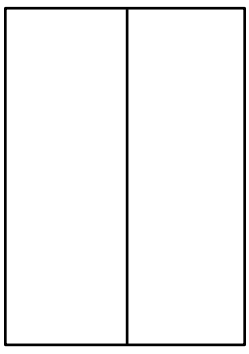
b) Downward arrow on both sides makes lines little shorter than a,

c) Outward arrows on both sides make line looks longer

a b c Than b

(a, b): Rectangle divided by vertical line.(a) looks narrow than an identical rectangle divided by horizontal line (b).

a



b

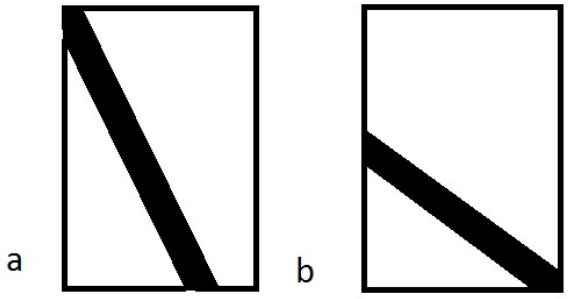
(a, b): In two identical Rectangles one divided with the narrow panel

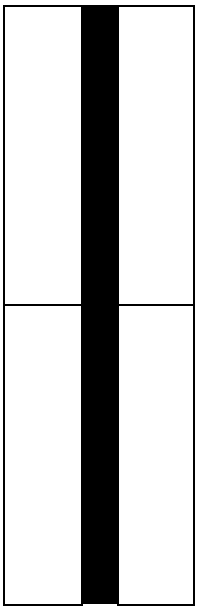
(a) appears much narrower than the one divided with the wide panel(b).

a b diagonal lines with different

(a, b):

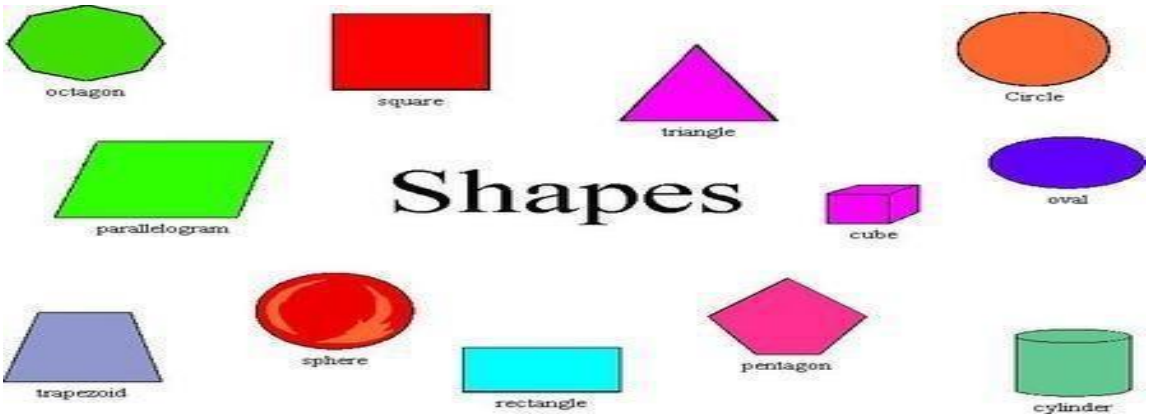
slant when divide rectangle give different look.



# Shape & Form

FORM is composed of lines of various types. The shape of an object is called form. This form may be actual or imaginary. All forms are the variations and combination of the four basic shapes the sphere, the cone, the cube, and the cylinder.




Basic types of Forms

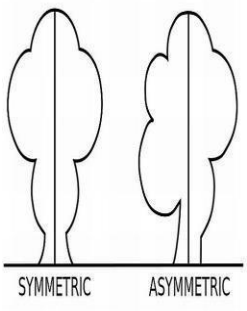
Forms or shapes may be of two types:

1. Symmetrical or regular

   Have two halves which are identical. But these shapes have monotony and little creativity is exhibited through these in design.

2. Asymmetrical or irregular

   Have two identical halves but asymmetrical forms are more interesting to look at and these are difficult to balance too, as shown in fig.




- Effects of forms

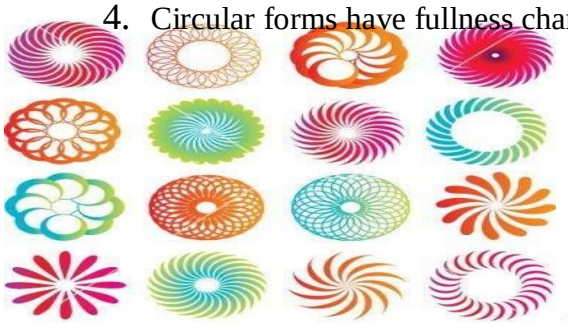
Form too has symbolic meaning,

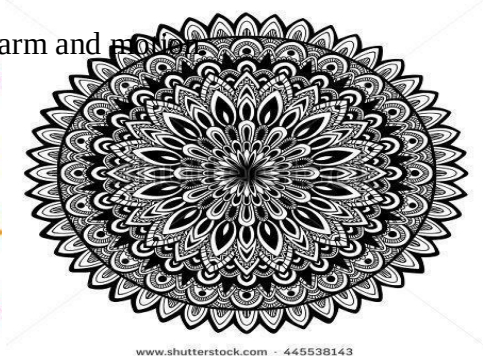
1. Square or rectangle forms shows Strength, stability and unity.

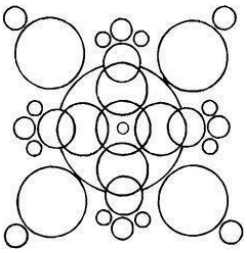

2. Irregular forms have permanence, security, evolution.

3. Oval forms designs have grace charm and creativeness in designs

4. Circular forms have fullness charm and motion.







Methods of creating different effects by forms

1) Monotony of design can be avoided by use of various sizes of same forms

2) By use of different colour combination and texture in the same form

SPACE

Space is an important element of visual design. It is the area from which a composition is made, it may be two dimensional or three dimensional. Smaller areas are usually called as shape and larger areas as space. A patterned surface is more easily named as shape then a plain area, which

is generally perceived as space .there are two kinds of space they are negative space and positive space.

## POSITIVE SPACE

Positive space are the area that are occupied by an objects and forms. It refers to the main focus of a picture.

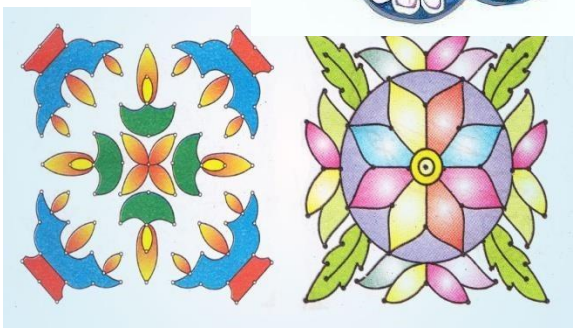
## NEGATIVE SPACE

Negative space is the area in between, around through or within an object negative space refers to the background.

□ADVANCING TECHNIQUE

This technique is for creating bold effect, in this technique shape should be small and completely surrounded by solid thick line and shapes should be in advancing colours.

□FLATTENING TECHNIQUE:



This technique creating soft eff Shape should neatly equal space. The should touch ea and should not be completely surrounded by space. Lines used to enclose the shape should be fuzzy, thin and broken. And their shape should be in receding colours.

SPACE AROUND A DESIGN:

Enough empty space to clarify the pattern is an important as the quality of the motif .pattern should not have so much space around it, that the eye leaps from unit to unit.

Always judge the arrangement of the units. To stabilize the pattern, the space around each unit much be greater. Or less than the unit itself never equal to it.

A dotted, or striped design or pattern and background equally spaced is dazzling to look at.

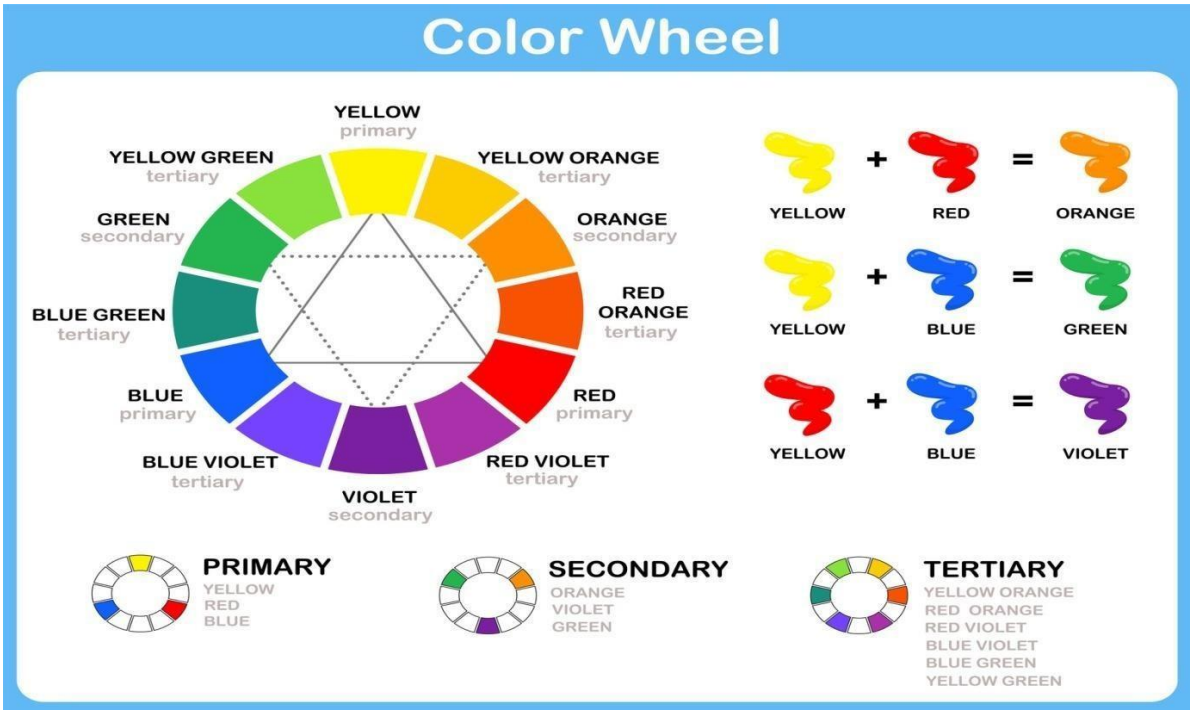

## DIVISION OF SPACE

FORMAL DIVISION: Lines are so draw that the design space is equally divided horizontally and vertically. This division exhibits balance, unity and equality.

INFORMAL DIVISION: Lines are drawn to make shapes but not in a symmetrical way. But a feeling of balance is brought. This division symbolizes progress, creativity, and action.

In design one shape should lead and should be supported by all the others. A combination of varied shapes produces the most arresting patterns solid masses, such as stylized flowers and leaves combine with thinner lines such as steam .the thin lines connecting the solid shapes produce continuity of motion.

COLOUR




Colour has three properties, the first is hue, which is the name of colours. The primary hues are yellow, red and blue. Secondary colours are made by mixing two primaries. Intermediate colours are mixtures of a primary and an adjacent secondary colour.

The secondary property of colour is value, which refers to the lightness or darkness of hue

The third property of colour is intensity, which refers to the brightness or dullness of hue also called Chroma.

COLOUR AND COLOUR SCHEMES

Introduction to Colour:-

Obviously there are thousands of variations of colors but any one dye color can look quite different on two different fabrics because of the contrast in texture. Think of the difference in appearance between a piece of blue velvet and a piece of canvas in the same blue. Dyes are more like ink than they are like paint, that is why being colored they

are also transparent and will only stain a paint if sufficient coats are applied will obliterate the color underneath it. So when dyeing, you must remember that the final result will be strongly influenced by the original color of the article. For e.g. a light blue dress dyed rose red will not come out rose red but will turn purple. You can only dye to a color which is darker than the original color of the item. However because of the staining as opposed to covering properties of dye, you can have a lot of fun trying out different color combinations on both plain single color fabrics and on multi-colored patterned material.

A bright fabric can be dyed to any color but a pale color fabric may influence the new dye color depending upon how intense the original color is. A pale grey rust dyed cream will become a pale greyish- cream rust, a much better idea would be a strong red or blue.

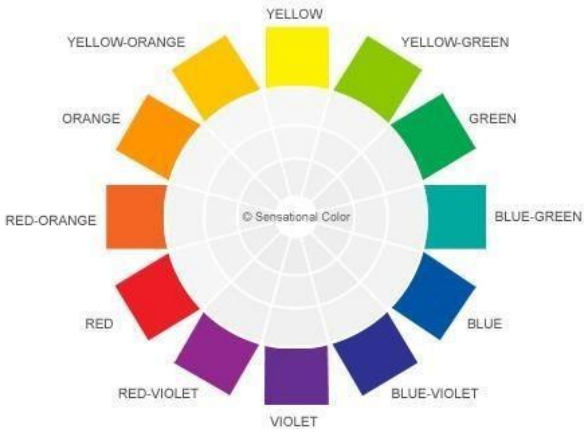
Any color can be dyed to black but don't expect a selection of different colored items to come out all looking the same black some may appear bluish – black others brownish – black, some a very dark grey.

You might be surprised to learn, that the human eye sees as many as six to seven million colors. Colours can inspire .Colours can influence
.Colours can have a huge impact on our lives. It is one of the least expensive factors that can be altered in the production of clothing. It is the essence of dressing successfully, it is the first thing that others see about you & probably what they will remember about you.

Once you understand & use the magic of colours, you will be able to harness its power to look better, feel healthier & energize you and the people you meet & all of that just from colour.

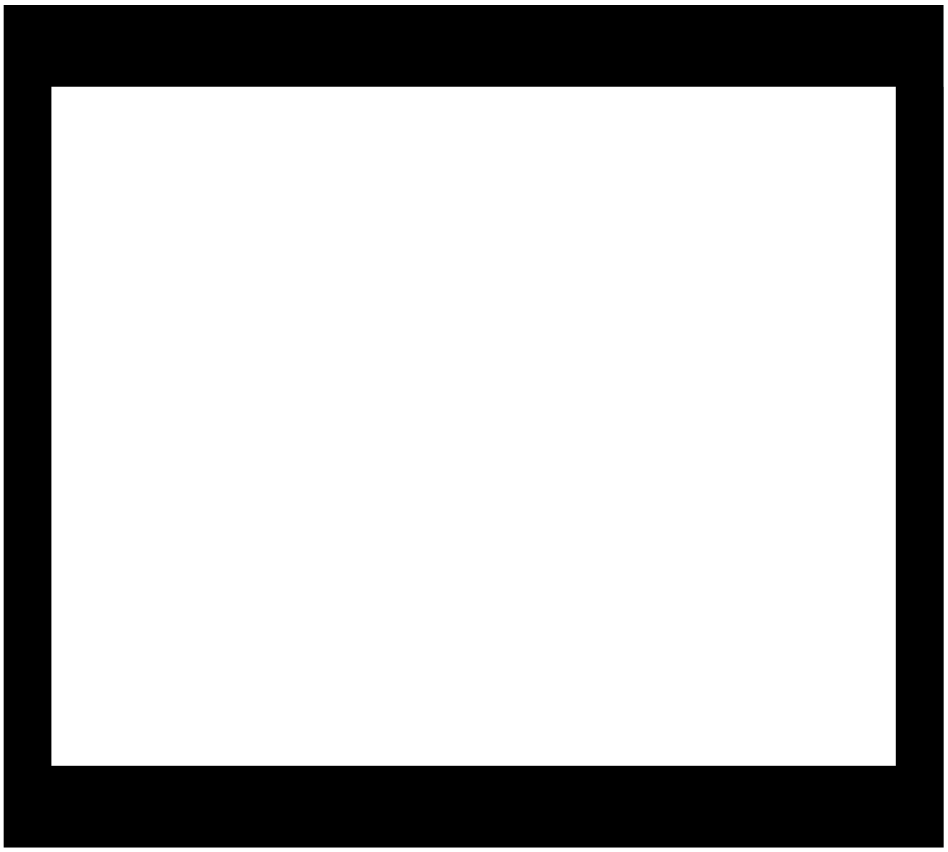
To work with color, you need a system that organizes hues into a logical pattern. Such a system can help you manage any possible color combinations and determine how the colors work together. Artists color wheel is a system that places colors around a circle. Position on the wheel show how the colors relate to each other.

The color wheel:




- Primary Colors: Red, Yellow, and Blue are the three primary colors, the basic colors from which all other colors are made. These three colors are equally spaced from each other on the wheel.
- Secondary Colors: Combining equal amounts of two primary colors create a secondary color. These three colors appear halfway between the three primary colors. Blue and yellow makes green. Blue and red makes violet, which is often called purple & Red and yellow makes Orange.
- Intermediate Colors: If you combine a primary color with a neighbouring secondary color, an intermediate color is created. Blue and green combine to make blue – green. Red combines with orange to make red-orange, likewise yellow-green, yellow- orange, red-purple, blue-purple, colours are obtained.

There are many theories of colour, but most commonly used is PRANGS COLOUR THEORY. . Prang was a printer and developed a four-color printing process known as chromolithography in the 1860's. Prang's system was the first workable system to reproduce color in print. He is sometimes referred to as the father of the American Christmas Card. The Prang color system is most often used by artists in determining what paint pigments to mix in order to produce desired colors out of the basic primary colours.



Prangs colour theory.

The Prang color system is the basis of the artist's color wheel, and it uses red, blue and yellow as its primaries. This system theorizes that the three primary colors can't be produced by mixing other hues.

Secondary/Binary colour: These are orange, green and violet in the Prang system. These can be produced by mixing together two primary hues.

Intermediate colour: When a primary and a neighboring Secondary/binary are mixed, the resultant is an intermediate hue. In appearance, the intermediate hue is halfway between the two colors. There are six of these intermediate hues: yellowgreen (YG), blue-green (BG), blue-purple (BP) or blue violet (BV), red-purple (RP) or red violet (RV), red-orange (RO), and yellow-orange (YO).

Tertiary colours: When two binary colors are mixed a tertiary colour is obtained. The tertiary colors are yellow, blue, and red, much neutralized. Tertiary yellow resembles a smoky yellow, Tertiary blue is known as slate blue, &Tertiary red is the colour of old red brick.

| Secondary colours | Tertiary colours |
|---|---|
| Orange + Green = (R+Y) +(Y+B)<br>Purple + Orange = (B+R) +(R+Y)<br>Green + Purple = (Y+B) +(B+R) | Tertiary Yellow (Ty) (Smoky yellow) (2Y+1R+1B)<br>Tertiary Red (TR) (Old red brick) (2R+1B+1Y)<br>Tertiary blue (TB) (Slate blue) (2B+1Y+1R) |

Quaternary colours.

A mixture of two tertiary colors gives a quaternary. The quaternary colors are green, purple, and orange, much neutralized. They are sometimes spoken of as olive, prune, and buff. Quaternary green is a mixture of the tertiaries yellow and blue. Tertiary yellow (B + Y + Y
+ R) added to tertiary blue (R + B + B + Y) gives this sum of colors- three parts of yellow, three parts of blue, and two parts of red. The result of the mixture is green, from the predominance of yellow and blue, and it is much dulled with the red. The quaternary purple is 'a mixture of the tertiaries blue and red. R + B + B + Y and Y + R + R + B make three parts of red and three parts of blue, giving purple, with two parts of yellow to dull it. Quaternary orange is tertiary red (Y + R
+ R + B) mixed with tertiary yellow (B + Y + Y + R). This makes three parts of yellow and three parts of red, which give orange and the two parts of blue neutralize the orange.

| Tertiary colours | Quaternary colours |
|---|---|
| Tertiary Yellow + Tertiary Red= (2Y+1R+1B) (2R+1B+1Y)<br>Tertiary Red + Tertiary blue (2R+1B+1Y) (2B+1Y+1R)<br>Tertiary blue + Tertiary Yellow (2B+1Y+1R) (2Y+1R+1B) | Quaternary Orange (Qo) (Buff) (3Y+3R+2B)<br>Quaternary Purple (Qp) (Prune) (3R+3B+2Y)<br>Quaternary green (Qg) (Olive) (3B+3Y+2R) |

Dimensions of colour:-

On a color wheel, the colors are very bright and vivid. Most colors that you see around you, however, are lighter, darker, or softer than the hues on the color wheel. Just as every object has length, breadth, width, every colour has three properties or qualities of colour also known as the dimensions of colour. They are hue, value, & intensity.

**a)** Hue:

Have you ever owned a box of crayons that offered more colors than you knew existed, with names that were just as imaginative? A crayon might be cherry, ruby, or flame. A more precise way to describe color is with the specific names that identify them, such as red, green, and blue. These are called Hues. A HUE is the purest or brightest form of a color that have not been mixed with white, gray, or black. The difference between blue & the green is the difference in hue just as soon as green turns bluish, it has changed its hue & would be called blue- green instead of green.

**b)** Value :-It is the second dimension of colour, it is independent of its hue. It tells the lightness or darkness of a hue. The lighter values are called tints and the darker ones are shades. The hue may be mixed with just a touch of white or with so much white that the hue is very faint. A color that is lightened by adding white is called a TINT. The pastels of pink, mint green, and baby

blue are tints. A color that is darkened by the addition of black is called a SHADE. Navy blue is a shade of blue; brown is a shade of orange. . The hue mixed with any amount of gray is considered a TONE of the hue.


TINT SHADE

TONE

Adding white or black to a color changes its value. Every color has a wide range of value, from very light to very dark. e.g. Red can go from a very pale pink to a dark burgundy. A value scale runs from white to black. White is pure light, black is the total absence of light, adding white lightens a colour and adding black darkens it.

### *c) Intensity or Chroma:-*

The third dimension of colour refers to how bright or dull a colour looks, bright colors are considered more pure, they have a higher intensity as compared to pale or dull colours, For example, Chroma is considered to refer to the brightness of a color when it is compared to the brightness of another color that appears white. Bright colors are deep and vivid because they contain the most colour pigment, they are Jewel intense. Tones, such as emerald green and ruby red, are examples of high intensity colors.

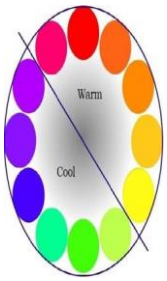
Dull colors, despite the term, are not necessarily boring or drab. Colors like dusty rose and khaki green are softer, muted, or subdued. You can reduce the intensity of a color by adding grey or its complimentary color. Adding grey to yellow for example, creates beige. Like pure colors, tints and shades can also have different intensities. The pink of a rose petal can be very soft and pale, while pink nail polish may be fluorescent bright. The higher intensity hues are known as jewel tones while the pale intensity hues are called muted tones (dull colors can appear indistinguishable or gray)

Colour Types:

Warm colours, cool colours, & neutral are three colour types. Colors have symbolism and meanings & telling us something about the personality of the wearer. As you design, it is helpful to keep in mind how the eye and the mind perceive certain colors. Sometimes colors create a physical reaction (red has been shown to raise blood pressure) and at other times it is a cultural reaction (in the N.A. white is for weddings, in some cultures, white is the color for mourning and funerals). Colors follow trends as well.

**a)** Cool Colors (calming): colors that symbolize cold temperatures are ice, water, sky i.e. blue, green and light purple have the ability to calm and soothe. Where warm colors remind us of heat and sunshine, cool colors remind us of water and sky. The cool colors have a receding effect that is, making the objects appear smaller

and farther away as compared to the object s in warmer hues. Therefore they have a minimizing effect on the body.




**b)** Warm Colors (exciting): Colors that symbolize to make you think of sunlight and heat, fire and make your body temperature rise, i.e. Red, Yellow, Orange (& Black). As the name indicates, they tend to give warmth. Warm colors look as though they come closer, or advance (as do ).

dar k

Mixed Cool/Warm Colors: Colors that are made of both a warm and a cool color. The symbolism of a mixed color depends on whether there is warmer or more cool used to make the color, i.e. green, Purple.

**c)** Neutral Colors (good for backgrounds): Colors with no strong differentials.

You may wonder why black and white are not on the color wheel. In technical terms, they are not true colors because they do not have color pigment. You see them because of what happens to light. When all the light rays are absorbed by a surface, you see the surface as black. When all the light rays are reflected from a surface, you see white.

Black and white are called neutral colors. Gray, a combination of black and white, is also a neutral color. Sometimes tints and shades of beige are being considered neutrals, but they aren't true neutrals because they have yellow or green base. Neutral colors are very useful. You've already seen how they can change the value and intensity of a color. E.g. Adding white to orange produces a peach tint. Adding gray to orange softens the intensity to buff. Neutral colors have become very popular over the past several years for their versatility and ability to pair with many other colors and materials.
Gray paint color can be cool or warm Creating a color scheme:

Suppose a young family member puts on an orange and blue shirt with a pair of dark red pants. You might decide to suggest a color combination that is more pleasing to the eye.

Knowing what colors work well together takes an understanding of color and the differences between the many values and intensities. To make it easier, experts have identified several color scheme that can be used as guidelines. A color scheme is a plan for using a color or a combination of colors – to decorate a room or put together an outfit.

Color schemes:

Colour schemes are often described in terms of logical combinations of colors on a color wheel. Color schemes are used to create style and appeal. Colors that create an aesthetic feeling when used together will commonly accompany each other in color schemes. A basic color scheme will use two colors that look appealing together. More advanced color schemes involve several related colors in "Analogous" combination.

Related colour schemes: a) Similar harmonies:

- Monochromatic colors: Are all the colors (tints, tones, and shades) of a single hue. Monochromatic color schemes are derived from a single base hue, and extended using its shades, tones and tints (that is, a hue modified by the addition of black, gray (black + white) and white. As a result, the energy is more subtle and peaceful due to a lack of contrast of hue.
- Analogous colors: (also called Dominance Harmony) color scheme are groups of colors that are adjacent to each other on the color wheel, with one


being the dominant color, which tends to be a primary or secondary color, and two on either side

complementing, which tend to be tertiary e.g. Blue- violet, Blue, Blue-green.

It is the scheme which creates a rich, monochromatic look. It's best used with either warm or cool colors, creating a look that has a certain temperature as well as proper color harmony. It lacks contrast and is less vibrant than complementary schemes.

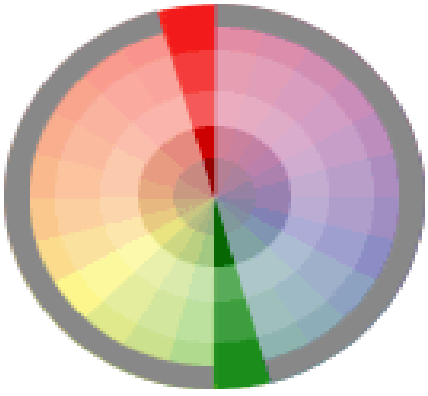
- Accented Neutral:

  Since neutrals have no hue, they combine well with any color. Matching white, black, or grey with a smaller amount of a color results in an accented neutral color scheme. The accent color brightens up the neutral color. A gray suit might be accented with a yellow tie or scarf, or a blue handkerchief. An accented neutral scheme is more often used to create a focal point, or point of interest. The eye is drawn to the accent color, making the areas more noticeable.


**b)** Contrasting harmonies:

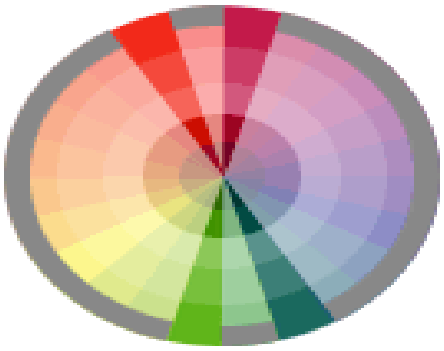
- Simple complementary colors:

  Those colors across from each other on a color wheel e.g. Green, Red.

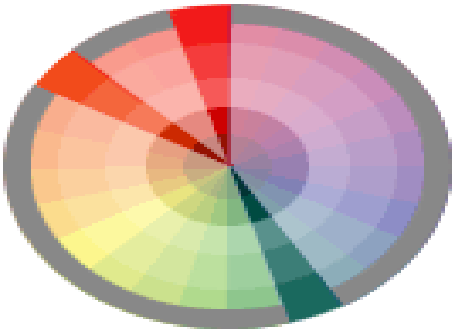


- Double complementary:

Two complementary color sets; the distance between selected complementary pairs will effect the overall contrast of the final composition e.g. Red, Red orange, Green, Blue green.



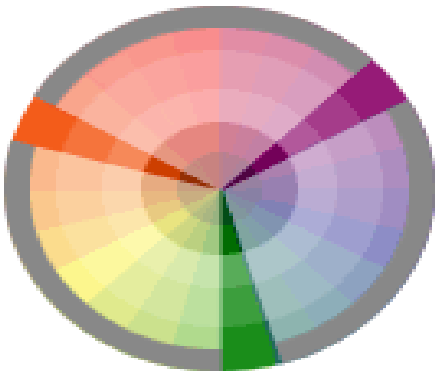
- Split-Complementary: One hue plus two others equally spaced from its complement e.g. Blue green, Red, Orange.



Triad color:

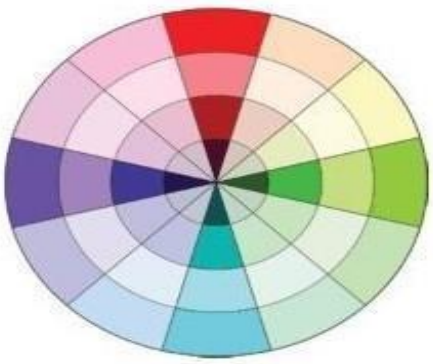
The triad color scheme uses three colors equally spaced around the color wheel. The easiest way to place them on the wheel is by using a triangle of equal sides. Triad color schemes tend to be quite vibrant, even when using pale or unsaturated versions of hues, offers a higher degree of contrast while at the same time retains the color harmony. This scheme is very popular among artists because it offers strong visual contrast while retaining

balance, and color richness. The triad scheme is not as contrasting as the complementary scheme, but it is easier to accomplish balance and harmony with these color e.g. Purple, Orange, Green.



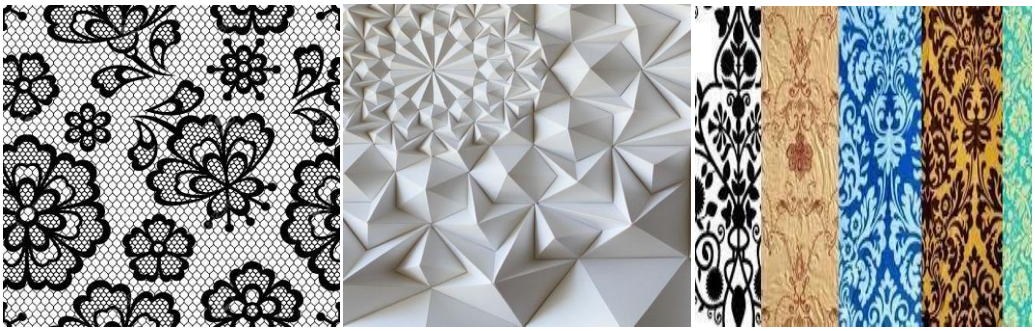
- *Tetrad colors*

The tetradic (double complementary) colors scheme is the richest of all the schemes because it uses four colors arranged into two complementary color pairs. This scheme is hard to harmonize and requires a color to be dominant or subdue the colors; if all four colors are used in equal amounts, the scheme may look unbalanced e.g. Orange, Yellow green, Blue, Red purple.



# TEXTURE

Texture refers to the surface quality, both simulated and actual of artwork. Everything has some type of texture, things as being rough, smooth, silky, shiny, and fuzzy. Some things feel just as they appear this is called real texture and things looks like they are rough but are actually smooth texture, created to look like something it is not, is called visual texture.



UNIT-5 PRINCIPLES OF DESIGN

Principles of designing guide and control handling the art element, line space, form, texture and colour. Principles leads to artistic development only if combined with personal, feeling, taste and imagination.

BALANCE

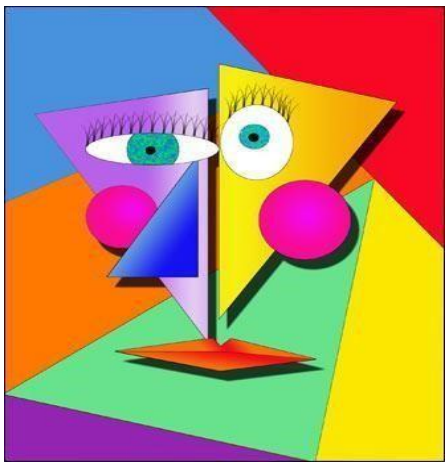
Balance is the arrangement of lines, colour, textures, forms and space. There are two types of balance, formal symmetry balance and Informal symmetrical balance. Balance is defined as the equal distribution of weight from a central point or area.

SYMMETRY - FORMAL BALANCE

It requires exact quality of left and right halves, as well as the more subtle balance of the unequal upper and lower section of the design .the identical repetition of parts on either side of an imaginary center line is called formal balance.

ASYMMETRY -INFORMAL BALANCE:

To balance a design informally, the right and left halves although different in size and shapes must appear to weight the same. This require the feeling for balance. True asymmetry is far more complicated the various parts of a design, although shape differently and made separately, must be assembled so that the balance is subtle .an arrangement of shapes and lines on one side can balance a different arrangement on the opposite sides if correctly placed this arrangement is called informal balance.



## PROPORTION AND SCALE

"Proportion", also known as spacing, is the arrangement of forms and shapes in space, and refers thus, to the relations of the parts of the other and to whole composition. Every design should be composed of shapes and spaces, related without too great difference or too much similarity. No shape should be so dominant that all others are insignificant, no background space should be entirely ignored .the eye seeks an orderly arrangement of space with variety, yet similarity.

SCALE also has to do with proportion, in designs cutting down or increasing the size of all shapes and details,

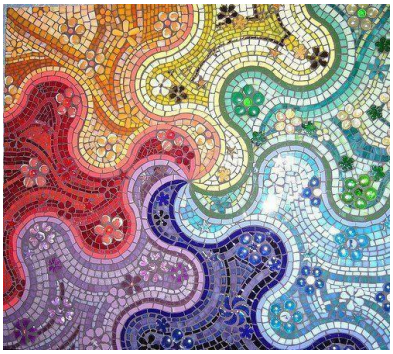
Proportionate design

Unproportionate design

## RHYTHM

The term “rhythm" in design, is the measure of the line movements so that one form predominates in a single design. Rhythm gives feeling of energy and force. It is of special importance in decorative designs. Rhythm refers to the way in which the eyes move from one part of a design to another.

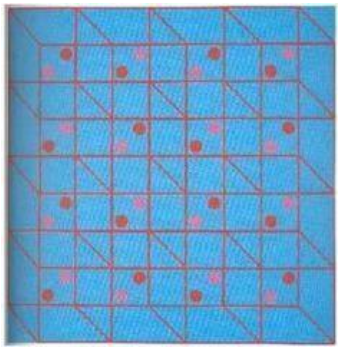
1. Fluid Rhythm:



When transitional curves or radiating oblique lines produce the dominating harmony.

2. Staccato Rhythm:

When opposing shapes and spaces are harmoniously repeated .Rhythm is altogether lacking when the forms are so confused that no one form is clearly evident. Staccato refers to abrupt changes with a dynamic contrast. Unity is important when choosing a staccato rhythm.

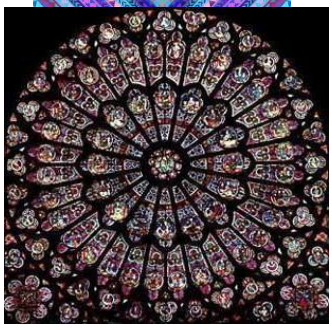


Types of Rhythm

Rhythm Can Be Obtained in Four ways.

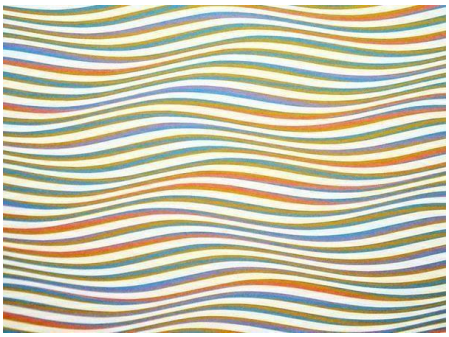
i) Rhythm by Repetition: In design rhythm can be obtained by repetition of regular shapes, motif, colours etc. rhythm are created by repeating shapes, colour, pattern and texture. shown in fig

ii) Rhythm by Progression or Gradation: When an element is repeated in different amounts, gradation occurs and it is more pleasing. Rhythm created by gradation changes in size or colour.



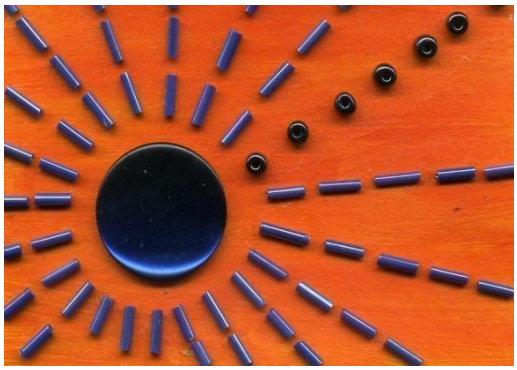
iii) Rhythm by Radiation: Radiation is an organised movement of element emanating from center of a point. All parts of composition are balanced and repeated around a centre.

iv) Rhythm by continuously flowing lines. It need not always be in a regular series but may be in some line, colour, texture, occurring in the main theme of the look.



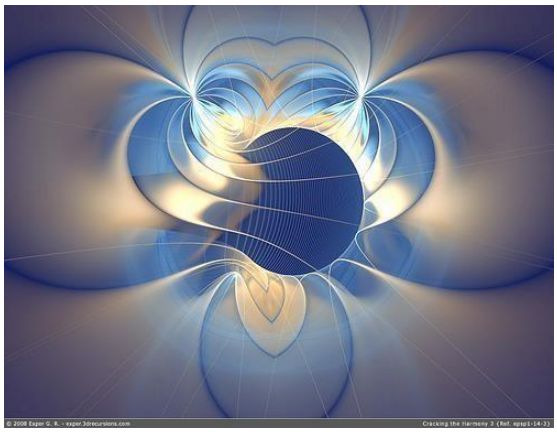
EMPHASIS

Every successful design contains many points of interest subordinated to one major theme. When several points for attention no clear plan is dominant, A design is appears confused. One form of rhythm always must be emphasized to establish one dominant interest. Leading the eye smoothly through out a design requires skillful repetition of shapes or flow of lines. If lines and shapes does not accomplish thus with enough force, contrast of colour may be tired.



HARMONY

Harmony means mean unity or a single idea or impression, that is produce an impression of unity through the selection and arrangement of consistent objects and ideas which have a strong family resemblance and which combine to create and integrate and beautiful effect. Harmony should not be simply dullness, it is best achieved with a variety, shown in figure.



Recommended Books


- Srivastava, M., Udawat, P., Gandhi, D., Textbook of Hand Embroidery, Agrotech Publishing Academy, Udaipur, 2016
- Srivastava, M., Computer Aided Apparel Fashion Designing and Production Pattern Making, Himanshu Publications, New Delhi, 2011
- Rai, I., Indian Embroideries & Textiles, Books Treasure, Jodhpur, 2008
- Luniya, V., A Book of Textile Designs, Books Treasure, Jodhpur, 2010
- Sumathy. G., Elements of design and apparel design., New Age International Pvt. Ltd, 2002.
- Shorie,G.P.,Vastra Vigyan Ke Mool Sidhant,Vinod Pustak Mandir, Hospital Road, Agra, 2007.(Hindi Book)
- Verma, Promila.,Vastra Vigyan Avam Paridhan,Madhya Pradesh Hindi Granth Akademy, Bhopal, 2003 (Hindi Book)
- Jarnow, Jand Judelle, B.,Inside Fashion Business,Merill Prentice Hall, New Jersey, 1987

E BOOKS

- Hand Book of Technical Textiles - https://textlnfo.files.wordpress.com/2012/10/handbook_of_technical_textile_.pdf
- Textiles & Clothing - http://www.textbooksonline.tn.nic.in/books/11/stdxi-voc- textiles-em.pdf
- Fabric Study - http://cbse.nic.in/publications/vocational/Fashion %20Design%20 and%20Garment%20Technology/Fabric%20Study%20%20(Textbook%20+%20Pract ical%2 0Manual)%20XII.pdf
- Fiber to Fabric - http://www.nios.ac.in/media/documents/Sec Hmscicour/english/Home%20Science%20(Eng)%20Ch-10.pdf
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- https://iversity.org/en/courses/design-101-or-design-basics