6th Sem. B.Tech (Fashion & Apparel Technology)

PCFT 4304 KNITTING & NON WOVEN

Module- I (10 hours)

Definition of knitting, General classification of Knitting Machine - Flat & Circular, Knit, Tuck & Float Stitches & their uses. Knitting Needles – Latch, beard & compound needles.

Basic weft Knitted structure - Plain, Single jersey, double jersey, Rib , Interlock & Purl - their characteristics & uses in detail, ornamentation, derivatives of the structure & their properties.

Module-II (12 hours)

Warp Knitted Structure from Tricot and raschel Warp Knitting Machine. Machine parts, functions and knitting cycle.

Warp Knitted fabrics and their structure - single bar fabrics, tricot two full set guide bar structure(full tricot, lock knit, reverse lock knit , satin), open work effects (Marquisette, sand fly net, hexagonal net, raschel laces) , crepe fabrics.

Module–III (13 hours)

Classification of Non woven fabrics ,types of fibre used & end uses , methods of web preparation ,methods of bonding of webs ,Production of non-woven fabrics by needle punching, adhesive bonding , spun bonding ,melt blown process & characteristics of these fabrics, study of structure & properties of wet laid fabrics

REFERENCE BOOKS :

1. Knitting Technology, D. J. Spenner
2. Knitting Technology, H. Wirnatt
3. Introduction to Weft Knitting, J. A. Smirfitt
4. Knitting, H. Wingall
5. Manuals of Non woven – Krema
6. Non woven textiles NCUTE publication

PCFT 4304 KNITTING & NON WOVEN

Module-1

Lecture Note 1

Defination of knitting:

Knitting is a method by which thread or yarn may be turned into cloth or other fine crafts. Knitted fabric consists of consecutive loops, called stitches. As each row progresses, a new loop is pulled through an existing loop. The active stitches are held on a needle until another loop can be passed through them. This process eventually results in a final product, often a garment.

A `***course***' of knit is a predominantly horizontal row of needle loops (in an upright fabric) produced by adjacent needles during the same knitting cycle

A `***wale***' of knit is a predominantly vertical column of interlaced needle loops generally produced by the same needle at successive (not necessarily all) knitting cycles

Course

Wale

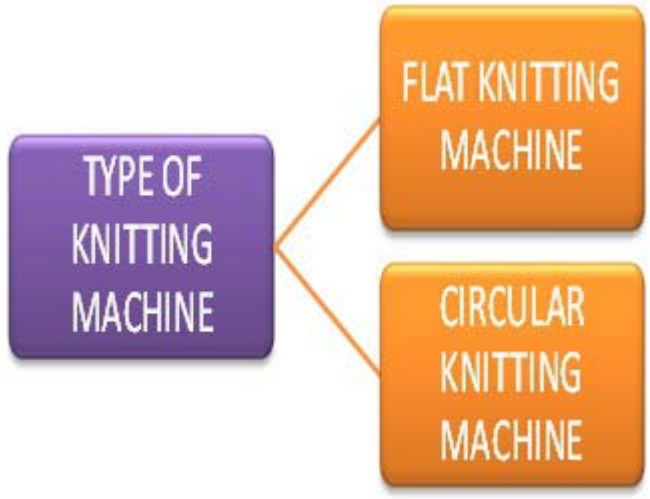
Stitch density:

Stitch density refers to the total number of loops in a measured area of fabric and not to the length of yarn in a loop (stitch length). It is the total number of needle loops in a given area (such as ten square centimetres). The figure is obtained by counting the number of courses in 10 cm and the number of wales in 10 cm, then multiplying the number of courses by the number of wales

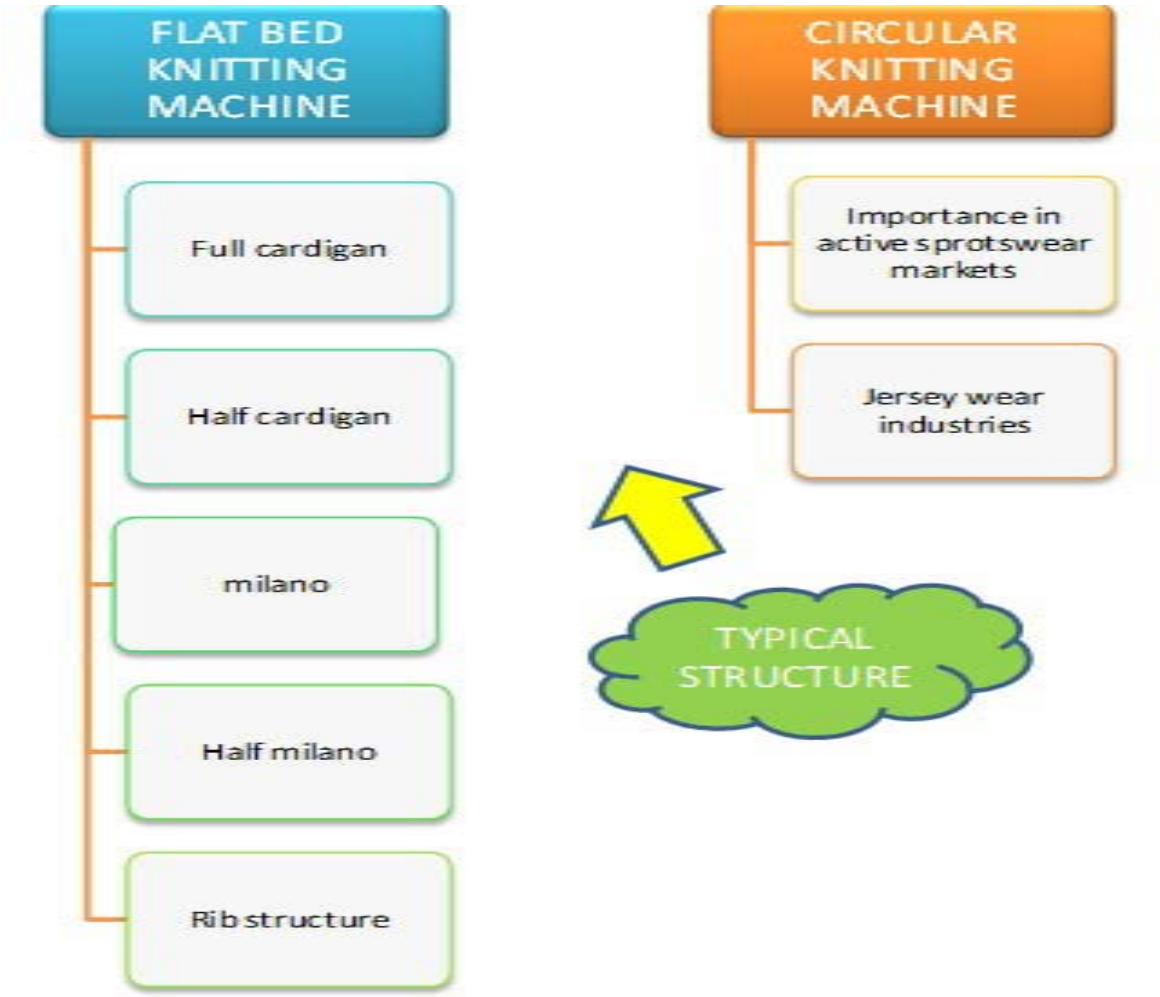
Technically upright

A knitted fabric is technically upright when its courses run horizontally and its wales run vertically, with the heads of the needle loops facing towards the top of the fabric Fig. 4). The term technically up right is purely a technical description, and does not necessarily indicate the orientation from a designers view point.

1.2 General classification of Knitting Machine -



- For Flat Knitting Machine, a V-bed type of machine may be use for knitting to produce design by using the facilities of rib loop transfer and needle backing.
- While for Circular Knitting Machine, the needle will be arranged on circumference of needle bed.



Circular Versus Flat Knitting Machine

- Production : Circular is much more productive than Flat Knitting Machine
- Patterning : Circular is less pattern design because of the restricted patterning abilities
- Fabric take-down : Fabric produce from Circular can't be driven directly.

- ***Lecture Note 2***

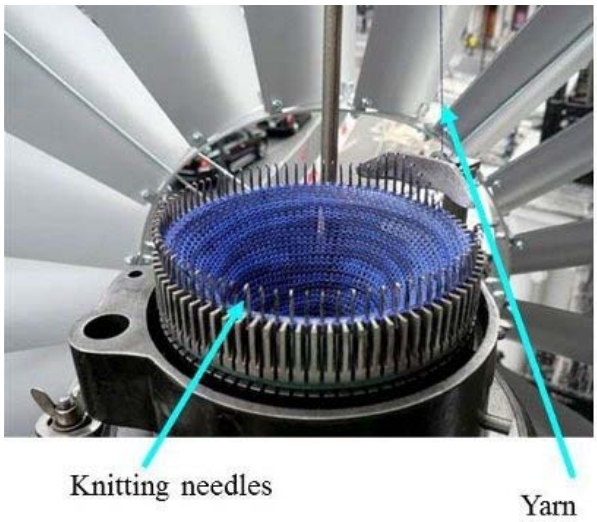
FLAT KNITTING MACHINE:

- Flat machines have their needles mounted in a flat plate or needle bed or in two beds at right angles to each other and each at a 45° angle to the horizontal.
- The knitted fabric passes downward through the space between the upper edges of the plates, called the throat. In the knitting process, the needles are pushed up and down by cams attached to a carriage with a yarn guide, which moves over the length of the machine.
- The width of the fabric can be altered by increasing or decreasing the number of active needles, allowing production of shaped fabrics, which when sewn together make fully fashioned garments.
- Although flatbed machines are suited for hand operation, they are power driven in commercial use, and, by selection of colour, type of stitch, cam design, and Jacquard device, almost unlimited variety is possible.
- The cotton frame, designed to knit fine, fully fashioned goods, shaped for improved fit of such items as hosiery and sweaters, is fitted with automatic narrowing and widening devices.

Flat knitting machine:

CIRCULAR KNITTING MACHINE:

- Circular machine needles are carried in grooves cut in the wall of a cylinder, which may be as small as 1 cm (0.4 inch) in diameter and as large as 1.5 metres (5 feet).
- Some circular machines have two sets of needles, carried in concentric cylinders, so that the needles interlock.
- During the knitting operation the butts of the needles move through cam tracks, the needles sliding up and down to pick up yarn, form a new loop, and cast off the previously formed loop.
- In the least complicated of these machines, yarn is supplied from one package, each needle picking up the yarn once per revolution of the cylinder.
- Modern machines may have as many as 100 feeders, allowing each needle to pick up 100 threads per revolution.
- Both latch and spring needles are used, with the former more common. Modern, large, circular, plain or jersey machines having 90–100 feeders are frequently used to produce medium-weight fabric.



Circular knitting machine:

Lecture Note 3

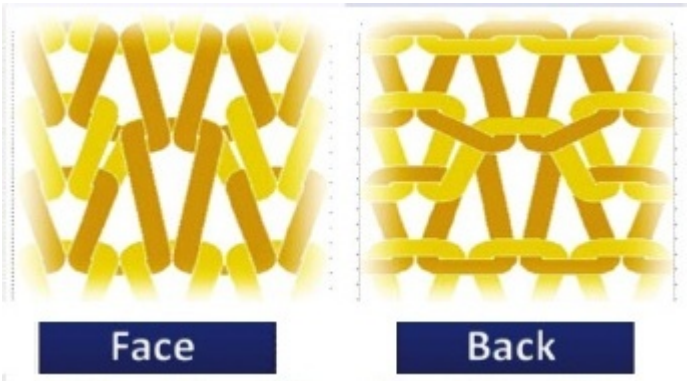
SINKER:

- Small bladelike units, or sinkers, are inserted between every two needles to engage and hold the completed fabric, preventing it from riding up with the needles as they are lifted to form new stitches.
- Machines may be fitted with pattern wheels controlling needle action to produce tuck and float stitches, and a Jacquard mechanism may also be attached.
- Stop motions are essential to stop the machine when a thread breaks.
- Because yarn tension affects fabric uniformity, various tension controllers have been devised.
- An alternative method, positive feed, which feeds precisely measured amounts of yarn into the machine, is now considered more satisfactory.

Knit, Tuck & Float Stitches & their uses.

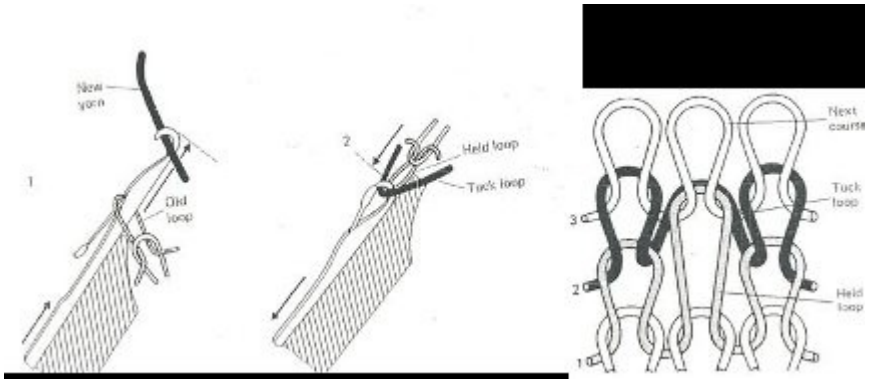
Knit:

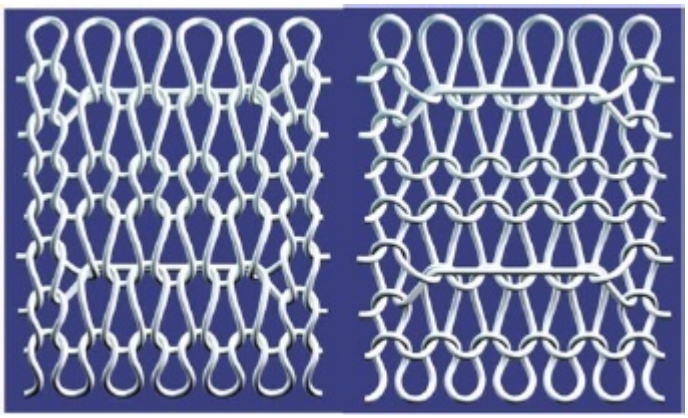
The knit stitch is the basic stitch. It is also called the plain stitch.Knit stitch is formed when the needle carries out a completestroke, reaching the maximum height on the looping plane.



Tuck:

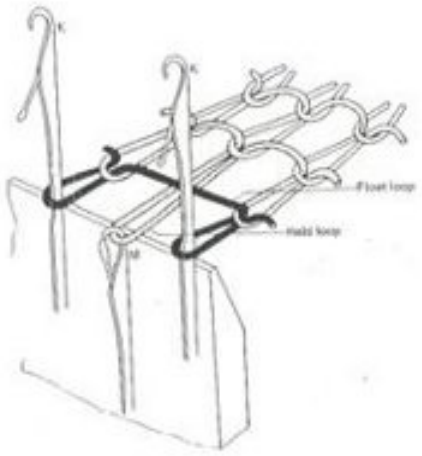
- A tuck stich is composed of a held loop, one or more tuck loops and knitted loops. It is produced when a needle holding its loop also receives the new loop.
- The tuck loop assumes an inverted U-shaped configuration.
- Tuck loops reduce fabric length and length-wise elasticity because the higher yarn tension on the tuck loop causes then to rob yarn from adjacent knitted loops, making them smaller and providing greater stability and shape retention .

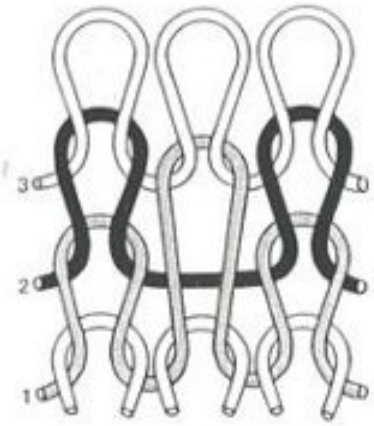


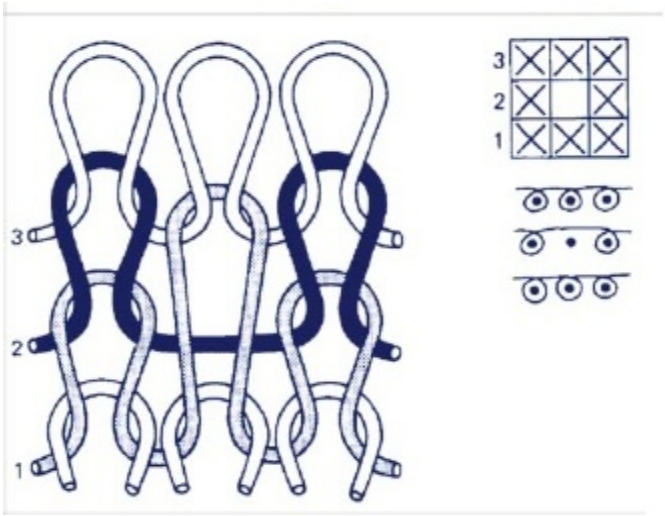


Miss/Float :

- A miss stitch or float stich is composed of a held loop, one of more float loops and knitted loops. It is produced when a needle holding its old loop fails to receive the new yarn that passes, as a float loop to the back of the needle, and to the reverse side of the resultant stich.
- A single float has the appearance of a U-shape on the reverse of the stitch.
- Miss stitch (float stitch) fabrics are narrower than equivalent all-knit fabric because the wales are drawn closer together by the floats, and reducing width-wise elasticity and improving fabric stability.
- A floating thread is useful for hiding unwanted coloured yarn when producing Jacquard designs







Lecture Note 4

Knitting Needles:

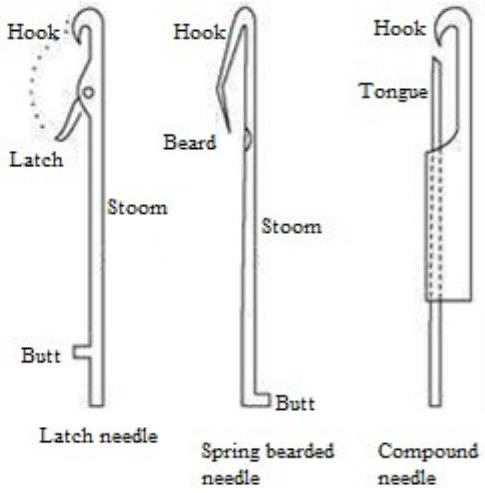
The hooked metal needle is the main element in a knitting machine. They are displaced vertically up and down and are mounted into the tricks or cuts of the knitting cylinder. The needle consists of six main parts:

1. Stem – Used to hold the course of old loops
2. Hook – The hook is used to catch a thread and form loops.
3. Rivet – Holds the latch in place and allows it to pivot.
4. Latch – The latch combines the task performed by the presser bar and the beard of the bearded needle.

5. Butt – The butt enables the movement of the needle to be controlled by a cam mechanism. A track raises and lowers the needle.
6. Tail – Used to provide support to the needle.

Different types of needles are:

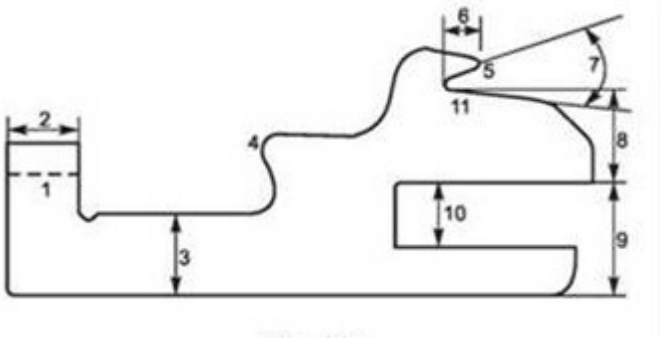
1. Spring beard needle
2. Latch Needle
3. Compound Needle



1=Butt,2=Butt height,3=Back shank,4=Stem,5=Crimp,6=Groove,7=Cheek,8=Hook,9=Hook width,10=Latch,11=Rivet

SINKER:

The sinker is the second primary knitting element. It is a thin metal plate with an individual or a collective action operating approximately at right angles from the hook side of the needle bed, between adjacent needles.



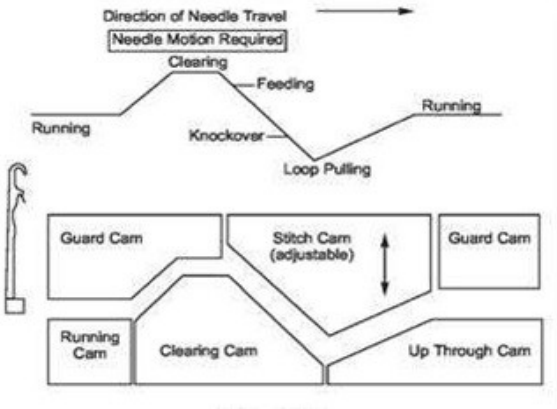
1=Butt,2=Butt breadth,3=Height of shank,4=Buldge,5=Neb,6=Length of neb,7=Throat angle,8=Sinker platform height,9=Breadth of lower shank,10=Clearance,11=Throat

Lecture Note 5

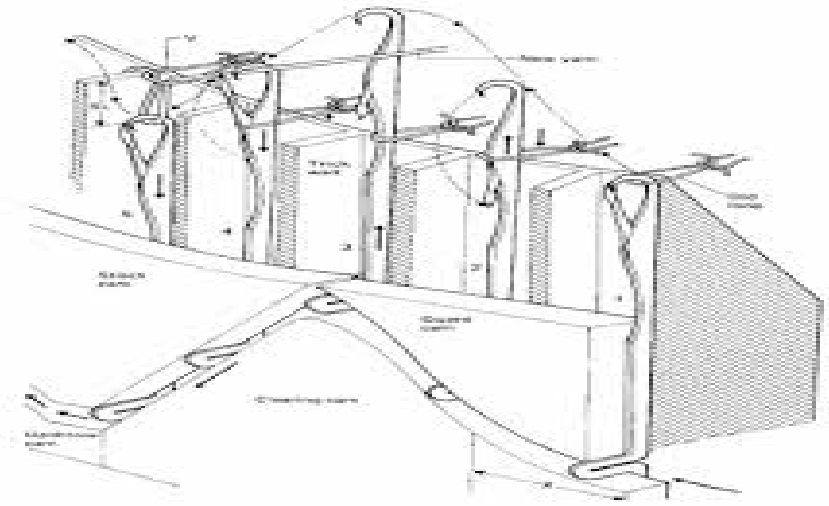
CAMS

The knitting cams are hardened steels and they are the assembly of different cam plates so that a track for butt can be arranged. Each needle movement is obtained by means of cams acting on the needle butts.

The upward movement of the needle is obtained by the rising cams or clearing cams. The rising cam places the needle at a certain level as it approaches the yarn area. Cams controlling the downward movement of the needles are called stitch cams.



Knitting action of latch needle:



Basic weft Knitted structure:

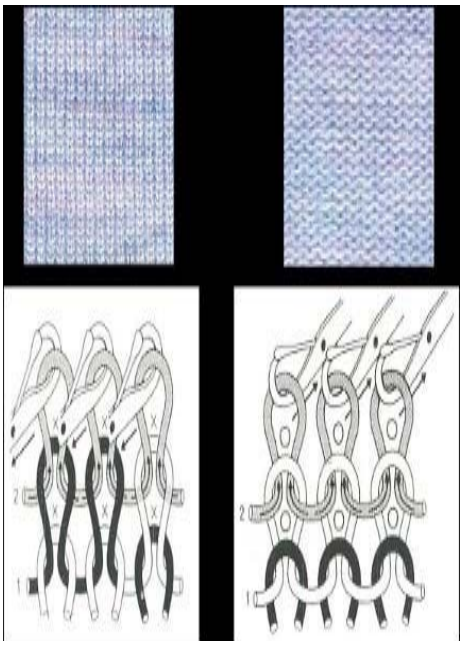
All weft knits fall into three basic categories: rib knits, which are a combination of knit and purl stitches; purl knits, which are made with purl stitches alone, and jersey knits, which are made with knits stitches on the front and purl stitches on the reverse.

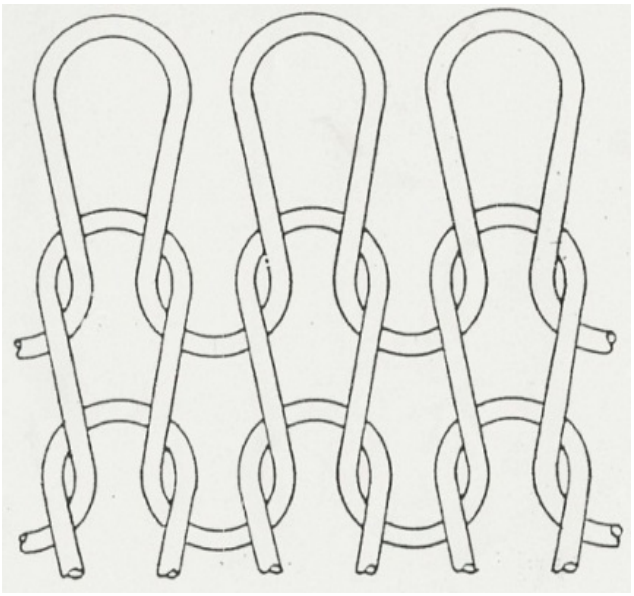
Single Jersey (Plain):

Characteristics:

i. simple knit structure
ii. Face side smooth & sheen
iii. Back side rough & dull.
iv. Lighter fabric.
v. Unravels at both ends.
vi. Highly extensible in length & width
vii. Edges of the fabric tend to curl.
viii. Laddering is very common.
ix. Fabric thickness is approximately twice the diameter of the yarn.
x. Handling is difficult.
xi. Dimensional stability is less.

xii. Economical fabric (High rate of production.)





Description: Also referred to as plain knit or single knit. Have distinct right and wrong sides, with fine ribs running lengthwise on fabric's face and semicircular loops running across reverse. Many variations of stitches and fibers create wide variety of single knits, ranging from delicate openwork to heavy, thick piled fabric.

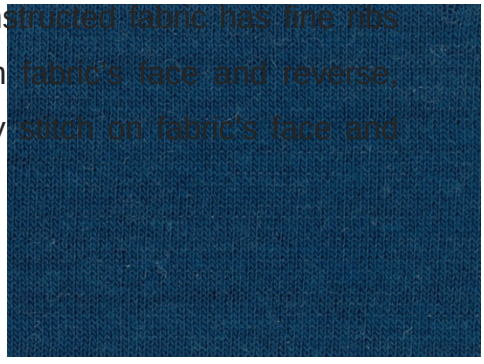
Properties: Little or no lengthwise stretch, varying amounts of crosswise stretch. Curls to fabric's right side; cut edges unravel only from end knitted last.

Best use: Jersey with little or no crosswise or lengthwise stretch (like most wool jerseys) can be used for skirts, blouses, and dresses without pattern adjustments. Jersey with crosswise stretch requires pattern adjustments or pattern designed for crosswise stretch.

Lecture Note 6

Double jersey:

Description: Made with two sets of yarns, this double-constructed fabric has fine ribs running lengthwise on both sides. Usually looks same on fabric's face and reverse, making it reversible. Fancy double knits may have novelty stitch on fabric's face and fine ribs on reverse.



Properties: Heavy, firm; usually has almost no stretch in either direction. Good shape retention; cut edges don't curl.

Best use: Tailored garments, like jackets, suits, or sheath dresses. If particular double knit has some crosswise stretch, adjusting pattern (by cutting it slightly smaller in body girth) may be necessary.

Purl structure:

- Several purl structure can be produced by arranging face & reverse loops in different orders.
- Moss stitch,Double moss stitch,Basket purl & Cable stitches are the Examples.
- It is used widely for childrens garment ,Knitted Sweaters.,shawls,scarfs,blankets.

Characteristics:

i. Both sides of the fabric are similar in appearance to the reverse side of single jersy fabric.
ii. Basic purls unravel from both ends like single jersy.
iii. Complex purls can be unraveled only at the end knitted last.
iv. Bulkier and thicke fabric.
v. Fabric does not curl at the edges.
vi. Equal extensibility in length & width.
vii. Full & soft handle.
viii. Laddering is common.
ix. Good opportunity for designs
x. Rate of production is low.

Description: Double-faced, reversible fabric produced by intermeshed rows of knit and purl stitches, which appear as loops in crosswise direction. Sometimes called

“Links-Links,” from the German word links (“left”), since knitting machine’s mechanism always moves to left.

Properties: Usually heavy and bulky; stretches in both directions. Cut edges do not curl.

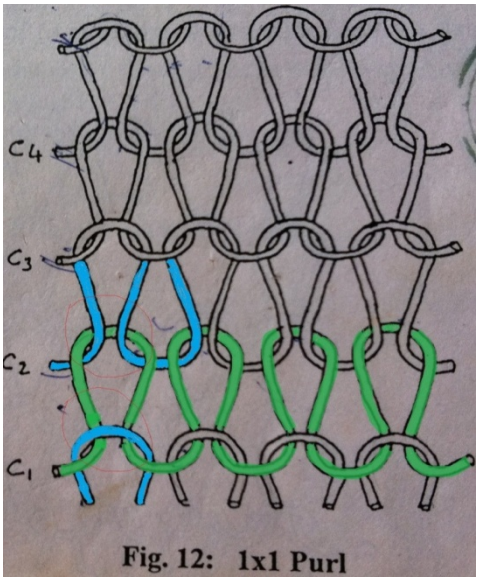
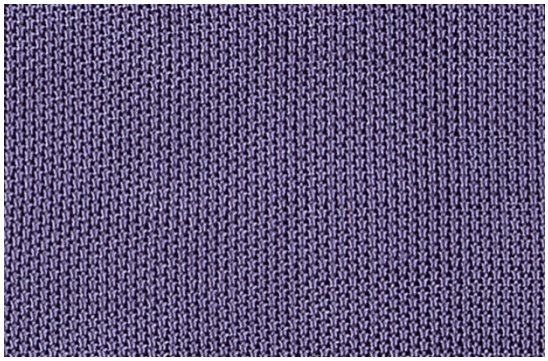


Fig. 12: 1x1 Purl

Best use: Sweater-type garments, outerwear.



RIB Structure

- Both back & front loops occur along the course
- Can be produced on V bed flat m/cs & circular m/cs.
- The order in which the needles are arranged decides the nature of fabric e.g 1x1,2x1,3x1,2x2,6x3 etc.
- Suitable for extremiries of garments.

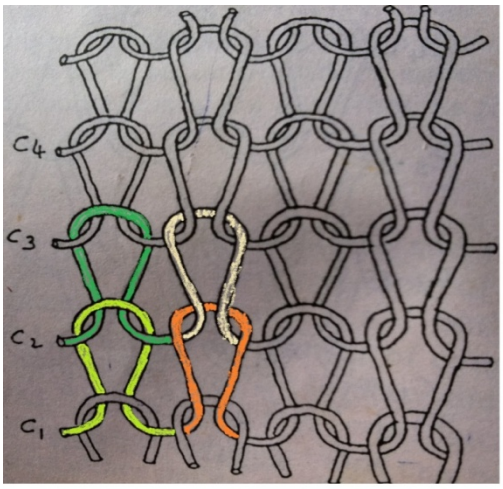
Characteristics:

- Double face or reversible fabric
- Similar cord appearance on each side
- Thicker & heavier fabric.
- Unravels at end knitted last
- Lies flat without curl.
- Excellent widthway elasticity.
- Each wale is made of a single type of loop either face or reverse.

Description: Double-faced, reversible fabric with distinct vertical ribs on both sides, produced by alternating knit and purl stitches. Ribs can be small (1x1, that is, one knit stitch followed by one purl stitch), thick, (2x2 or 3x3), or uneven (1x3, for example).

Properties: Little or no lengthwise stretch, but lots of crosswise stretch and good, natural recovery. Cut edges do not curl.

Best use: Because of its elasticity, ideal for trimming other knits (and wovens). Garments made from rib knits are usually close-fitting and therefore use a pattern designed for knits.



Lecture Note 7

INTERLOCK STRUCTURE :

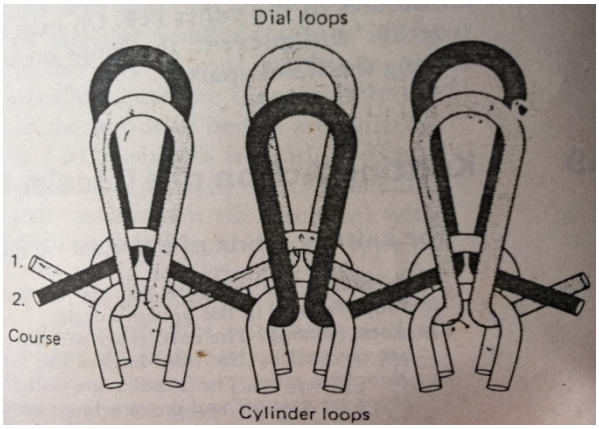
- It is made of two rib structures which are knitted alternately,first a course of one then a course of the second,so that two individual structures are intermeshed in a single composite fabric.

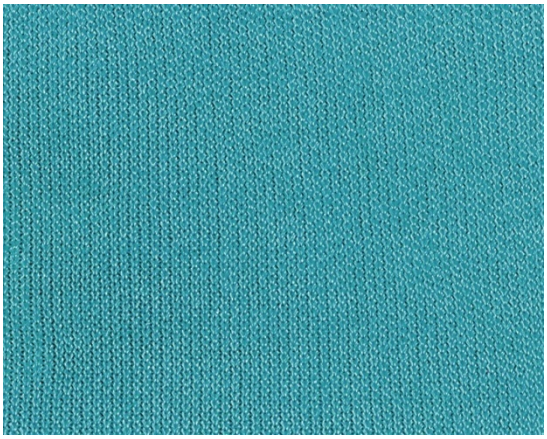
Characteristics:

- Both sides have appearance like face of single jersey.
- Luxurious soft handle
- More compact & stable
- Less extensible
- Lies flat without curl.
- Unravels at the end knitted last.

- Thicker fabric
- Horizontal & vertical stripes can be produced easily.
- Rate of production low.
- **Description**: Compound fabric made by “inter-knitting,” or interlocking, two simple ribbed fabrics, each made with single yarn. Has fine ribs running lengthwise. Fabric’s face and reverse look same, making it reversible. **Properties**: Almost no lengthwise stretch; more crosswise stretch than double knits or jerseys; fairly good shape retention. Raw or cut edges don’t curl; unravels only from end last knitted.

  Best use: Wonderful for T-shirts, turtlenecks, casual skirts and dresses, and children’s wear. Because of its crosswise stretch, use pattern designed for interlock knits, or be prepared to adjust pattern.





Ornamentation of plain knit fabric:

- Horizontal stripes
- Twist
- Fancy yarns
- Piece Dying
- Printing
- Plated jersy fabric

<u>Derivatives of the structure & their properties.</u>

Derivatives of plain knit (Single jersy):

- Knit & float (Fair isle)
- Knit & Tuck (Le coste)
- Knit,Tuck & Float (Accordian)

Knit & Tuck type:

- Often is made with cotton yarns.
- Used chiefly for sports wear because the tuck stitches if used 50% in the structure give it a cellular Appearance e. g Le Coste

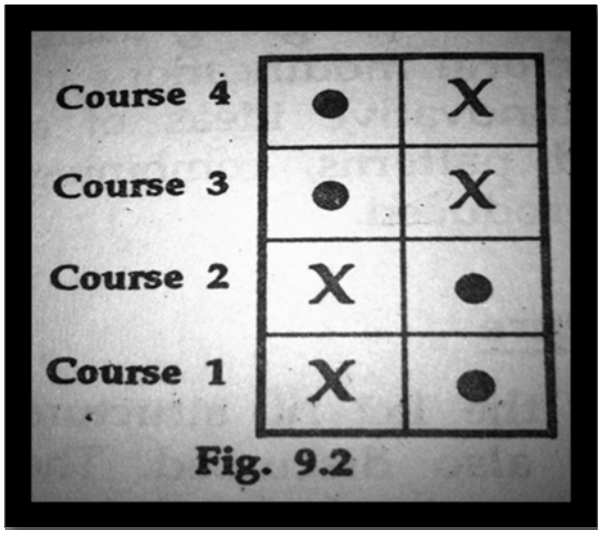
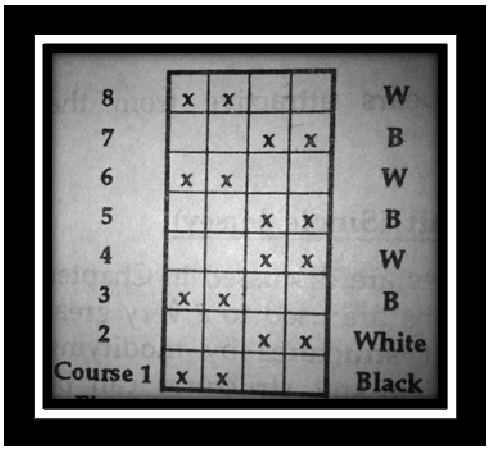


Fig. 9.2

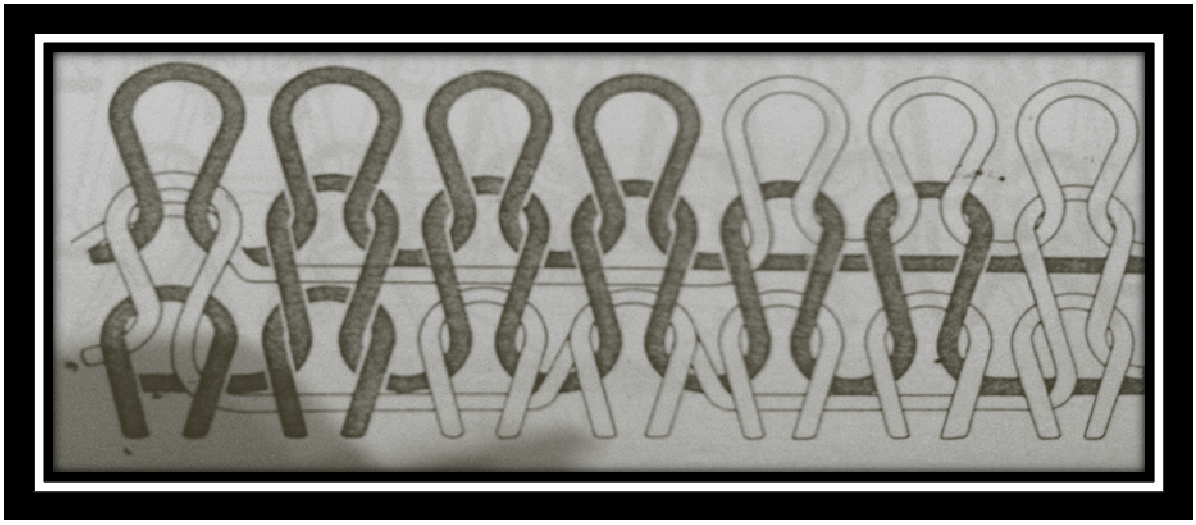
Knit & float Type check effect:

- Two coloured yarns are used. e.g Fair Isle



Knit ,Tuck & Float Type:

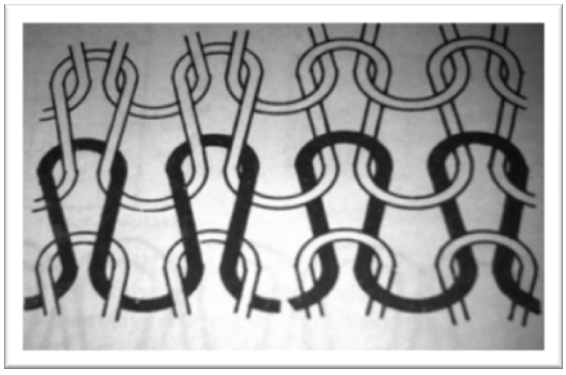
- These fabrics are usually made in wool with a combination of knit tuck and float stitches in the same course , e.g. Accordion type structure

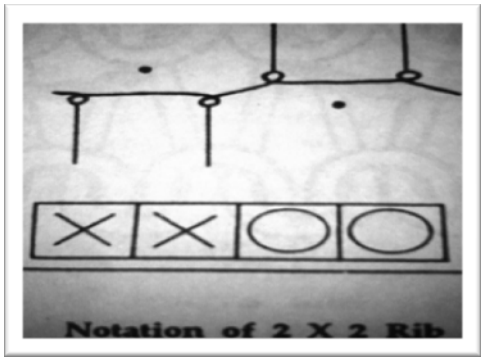


Lecture Note 8

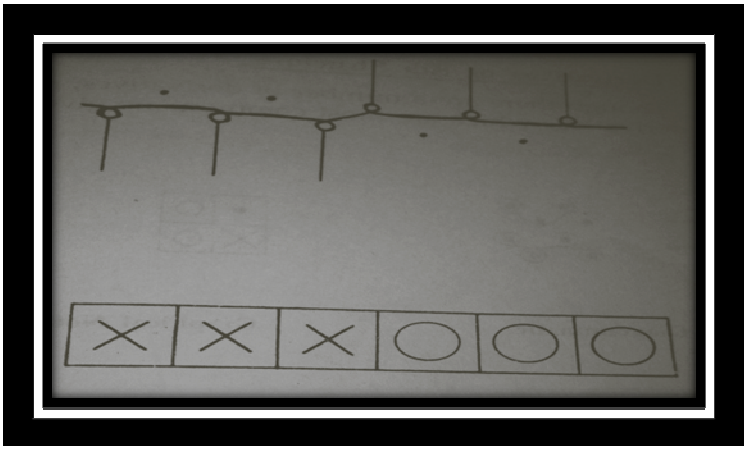
Derivatives of Rib structure:

2x2 Rib structure

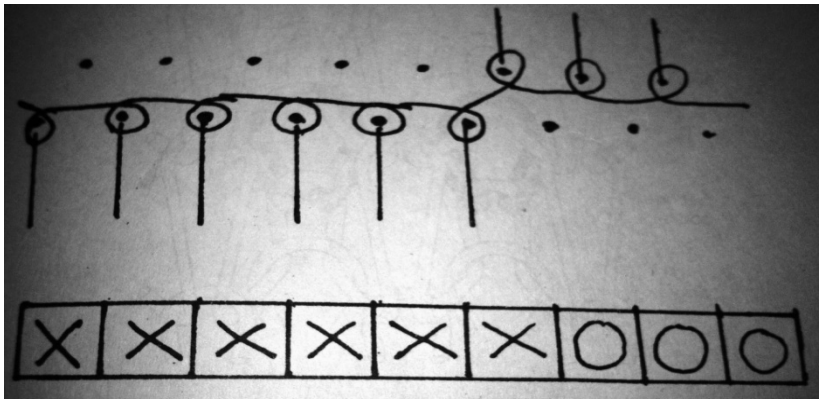




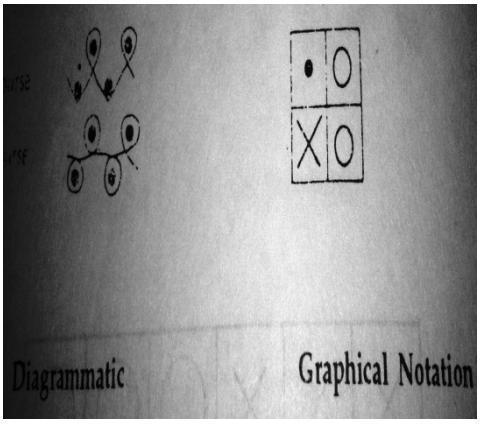
3x3 rib structure

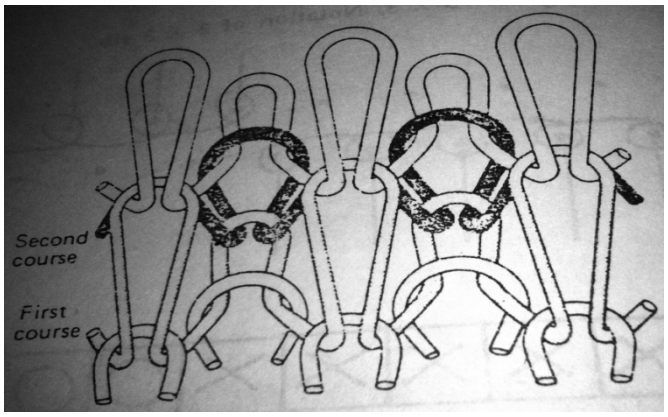


6x3 rib structure (Derby rib)



Half cardigan (Royal Rib)





Full cardigan (Polka rib)