# 1.11 Categorisation of Fibres and Textiles

**Natural Fibres:**
From plant sources include cotton, flax, hemp, sisal, jute and coconut. Fibres from animals include silk, wool and mohair.

**Synthetic Fibres:**
Artificial fibres are usually made using coal, oil and other petrol-based chemicals. Examples include polyester, acrylic, polyamide (nylon), elastane (lycra) and Kevlar.

***Properties:***

**Elasticity:** At low loads the fibres obey Hooke's law where the stretch is proportional to the load and the fibres will return to their original size.

**Resilience:** Resistance to being deformed or compressed. Fibres should spring back vigorously when pressure has been applied.

**Durability:** is the ability to resist wear. Depends on the choice of fibres and fabrics, and the user's activities and size.

**Key Terms:**
**Fibres:** thread-like elements that can be formed into yarns and fabrics.
**Fabric:** a length of flexible material constructed from fibres.
**Staple:** the length of a fibre
Monomer: a molecule that can be bonded to similar molecules to form long chains.

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| **Animal Wool:**  | From an Animal's fleece. Made of protein molecules. Produces a short fibre or staple with a crimp or kink which traps air creating warmth. | Coats, jumpers, suits, blankets, carpets and upholstery. | Warm, absorbent, breathable, durable, repels rain, hangs well, creases drop out. Dries slowly, susceptible to moth attack, can feel itchy, washes poorly, can shrink and heavy when wet. |
| **Plant Cotton:**  | Machine harvested where saw teeth remove waste from the seed pod and the resulting fibre is called lint. Cellulose makes the fibre strong, durable and absorbent. 20-30 layers of cellulose are coiled in natural springs. | Towels, denim, socks, underwear, T-shirts and bedding. Shorter fibres make bandages and insulation | Cool, absorbent, soft, resists abrasion, withstands frequent washing at high temperature, good drape, durable, does not stain easily, static and cling resistant, available in various weights, can be ironed at high temperatures, good colour retention.<br><br>Creases easily, burns, shrinks, dries slowly. |
| **Polyester:**  | Simple chemical molecules (monomers) are joined to form polymers by polymerisation. The polymer chains are spun into a yarn. | Raincoats, fleece jackets, children's nightwear, medical textiles, working clothes. | Strong when wet or dry, dries quickly, resistant to abrasion, soft, hangs well, durable, crease and stain resistant, easy care, can be recycled, resists bacteria.<br><br>Damaged by acids, low warmth, poor absorbency, does not breathe, not environmentally friendly. |

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**Woven textiles:**
**Weaving turns yarns into a fabric on a loom, which has an arrangement of warp (vertical) threads held under tension. The edges where the weft (horizontal) threads loop back form a non-fraying edge (selvedge).**

***Properties:***

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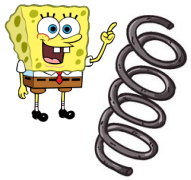

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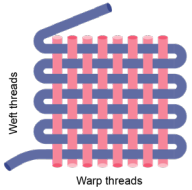
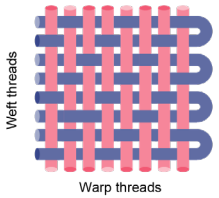
| **Acrylic:**  | Formed by polymerisation of at least 85% acrylonitrile or vinyl cyanide. The double bond between the first two carbon atoms is broken and the molecules join in a chain. | Imitation wool knitwear, upholstery fabrics, sportswear, fleece jackets and blankets. | Warm, dries quickly, good drape, durable, crease resistant, easy care.<br><br>Poor absorbency feels stiff, can irritate skin. |
| **Plain Weave - Calico:**   | A simple cotton cloth where the warp and weft pass over and under each other forming a criss-cross pattern. Calico (muslin) is naturally grey and can be soft or course. | Shirts, bags, bedding and textile crafts. | Strong, hardwearing, hangs well, same on both sides, cheap to make, creating a good background for printing and applied surface designs.<br><br>Firm and varied quality. |
| **Twill Weave - Denim:**   | The weft goes over 2 or more warp threads, repeated on the row but steps over one warp thread on the next rows to make a diagonal pattern. Denim is blue in the warp and white in the weft. | Jeans, jackets, curtains, blankets and soft furnishings. | Hardwearing, strong, hangs well less stiff and more interesting to look at than a plain weave.<br><br>Frays, thickness makes it hard to use. |

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**Non-woven textiles:**
Fabrics are layered at different angles to form a web, joined by either felting or bonding. Bonding joins the fibres with heat, solvents or adhesives, so is cheap to produce but not as strong as woven or knitted fabrics.

**Knitted textiles:**
**Knitted textiles are constructed from interlocking loops of yarn and are either warp or weft.**

***Properties:***

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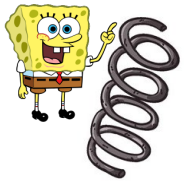

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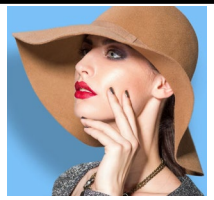
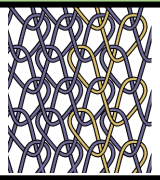
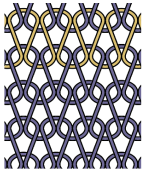
| **Felted wool fabric:**  | Scaly fibres of wool or hair become tangled as they are rubbed together when wet. Heat and pressure is then applied to join them. | Pool table surfaces, hats, bags, coats, slippers, applique quilts and wall hangings | Resists chemicals and fire, does not unravel or fray, can be repeatedly compressed and released without deforming, excellent sound insulator and environmentally friendly.<br><br>Expensive, no drape, not stretchy and deforms when wet. |
| **Bonded fibres/webs:**  | Does not fray, weaker when wet, can be produced in a range of weights and not very strong. | Fusible interfacing, wet wipes and disposable overalls. | Does not fray, cheap to produce, stable and retains shape.<br><br>Not very strong, does not drape and sometimes weaker when wet. |
| **Warp-knitted fabric:**  | Formed by vertical loops like a series of chains. It can only be produced on a machine. | Swimwear, geotextiles, lace, nets and fleece. | Fairly stretchy, retains heat and does not unravel.<br><br>Can lose shape and curls at the edges. |
| **Weft-knitted fabric:**  | A single yarn creates interlocking loops across the fabric. IF a loop breaks, a hole forms and ladders. Made by hand or machine. | T-shirts, jumpers, tops and socks. | Stretchy, comfortable and fast production.<br><br>Ladders easily. |