Yarn Structures:

Yarn Stuctures:

- Filament
- Staples

Filament Yarns:

- Long, continuous strands
- Monofilaments – single filament
    - Nylon hosiery
    - Open-work decorative fabrics
    - Fabric webbing (lightweight beach or casual furniture)
    - Industrial use
    - Can be made by extrusion of large single filament from spinneret or slim-fit technique
- Multi-filament – twist yarns together loosely or more tightly
    - Luster, hand, cross-sectional shape determines appearance and feel of yarn
- Texturing – modify feel and bulk of filament yarns

Staple Yarns:

- Spun yarns – staple-length fibers
- Multiple processes required to make staple yarns add to cost, aesthetics, appearance – highly desirable

Yarns Classified by Number of Parts:

- Single – group of filament/staple fibers twisted together
- Ply – twisting together two or more single yarns
- Cord – twisting together two or more ply yarns
    - Ropes, sewing thread, cordage, decorative yarns in some heavyweight novelty fabrics

Yarns Classified by Similarity in Parts:

- Single
    - Uniform size and regular surface
    - Varying degrees of twist (loose to moderate, tight, or hard)
    - Single, ply, or cord
    - Simple single – one strand of fibers twisted together evenly
    - Simple ply – two simple singles twisted together
- Novelty
    - Create interesting decorative effects in fabric
    - Fancy or complex
    - Novelty – single, ply, or cord; staple or filament
    - Complex – usually have more than one part

  - Weaker than simple counterparts – usually placed in crosswise direction of woven where strength not needed
  - Used in knitted/other fabrics to add texture and decoration
  - Boucle yarns (loop) – multi-ply yarns
  - Flake (flock) yarns – loosely twisted with fibers of another color (tweed)
  - Nub yarns (knot, spot) – ply
  - Slub yarns – ply or single of staple
  - Spiral (corkscrew) yarns – two piles, one soft and heavy, and fine
  - Chenille yarns

Thread:

- Used in sewing together sections of garments
- Made from one or more kinds of fibers
- Cotton and polyester most important
- High stability to bending, good strength, limited elongation, minimal shrinkage, good abrasion resistance

Yarn Twists:

- Effects of twists
  - Amount of twists affects properties (bulkiness)
  - Strength increases as twists increase to certain point
  - Yarns with exceptionally high tight twist become weak and brittle
  - Elasticity is increased if yarns are twisted highly
  - Crepe – very fine, high twists (curl)
  - Tightly twisted yarns shed soil more easily
  - Smoother surface
  - High twists – low absorbency
  - Abrasion resistance increases by tighter twists
- Directions of twists
  - "S" or "Z" twists
  - Z-twist – twisted so direction follows center bar of Z (right twist)
  - S-twist – twisted in direction so center bar follows S (left twist)
  - Most yarns are Z-twists

Yarn Size:

- Direct Numbering Systems
  - Direct methods of measurements rely on measurement of fixed lengths of yarns
  - Specific length of yarn is measured, length is weighted
  - Tex (g of 1000m) or denier (9000m/g)
  - Decitex (10000m)
  - Higher number – coarser yarn
- Indirect Numbering Systems

    - Rely on measurements of fixed weights of yarns
    - Establishes a number of hands (skeins) – pound or kilogram
    - Cotton count = # of hanks of 840 yds in 1 lb
    - Linen count = # of hanks of 300 yd in 1 lb
    - Woolen count = # of hanks of 1600 yd/1lb
    - Worsted count = # of hanks of 560 yd/1lb

Effects of Yarn Structure on Fabric Performance:

- Durability
    - Filaments stronger than staple – continuous fibers
    - Elongation and recovery used to determine end use and performance
    - Resistance to abrasion
- Appearance
    - Drape and hand – "tactile sensations or impressions" that arise when fabrics are touched, squeezed, rubbed, handled
    - Wrinkle resistance
    - Dimensional stability
    - Covering power – optical and geometric properties
- Comfort
    - Heat transfer – heat energy from generating body to surrounding atmosphere
    - Air permeability
    - Softness