

# Fabric Manufacture - I - Web course

## COURSE OUTLINE

Introduction to various fabric forming principles, weaving, knitting, nonwoven and braiding. Stages of woven fabric manufacturing, winding, warping, drawing and tying in and weaving. Winding, principles, precision and random winding, digicone winding, yarn tensioning and clearing.

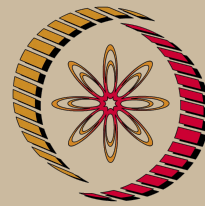
Warping, direct and sectional warping. Sizing, size materials for cotton and manmade fibre yarns, sizing machines and different zones, process control and quality evaluation, modern trends.

Drawing and tying in, basic fabric designs like plain, matt, rib, twill and satin, drafting and lifting plans.

Primary motions of shuttle looms, cam shedding systems, positive cam shedding, cam designs, picking systems, overpick and underpick, power requirement, loom timing, beat up, sley eccentricity, related calculations.

## COURSE DETAIL

Module No.	Name of the module	Contents	No. of Hours
1	Introduction to fabric manufacture	<p>Introduction to various fabric manufacturing methods like weaving, knitting, nonwoven and braiding, product range and applications.</p> <p>Sequence of woven fabric manufacture, Primary, secondary and auxiliary motions for weaving, Warp, weft, crimp, cover etc.</p> <p>Woven fabric designs, Plain, matt, rib, twill, and satin weaves and point paper representation.</p> <p>Warp and weft knitting, wales and courses, knitting cams and needles, loop formation during knitting, Web forming and bonding methods for nonwovens, dry laid, spun laid and spun laid nonwovens, needle punching, spun bonding, belt blowing and hydro-entangling processes.</p>	4
2	Winding 1	<p>Objectives of winding, types of packages, parallel wound, nearly parallel wound and cross would packages, advantages and disadvantages, yarn withdrawal, definition of wind, wind per double traverse.</p> <p>Types of winders, drum driven or random winders, spindle driven or</p>	4



NP-TEL

# NPTEL

<http://nptel.iitm.ac.in>

## Textile Engineering

### Pre-requisites:

Physics, Chemistry, Mathematics, Introduction to textiles, Textile fibres.

### Additional Reading:

1. An introduction to textile mechanisms by P. Grosberg.
2. Sizing - Materials, Methods, Machinery by Ajoankar, Talukdar and Wadekar.
3. Weaving- Machinery, Mechanisms, management by Talukdar, Sriramalu and Ajoankar.

### Coordinators:

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		<p>precision winders, expression for winding speeds, wind per double traverse and angle of wind.</p> <p>Package density, problems in winding, patterning, gain, step precision winder.</p> <p>Conditions for uniform building of cheese and cones, accelerated grooved drums.</p>	
3	Winding 2	<p>Yarn tensioning, objectives, additive and multiplicative tensioners, optimization of winding tension.</p> <p>Yarn clearing, principles of mechanical and electronic clearers, classimat faults, winding cuts and SLT channels, correlator curve, splicing and knotting.</p> <p>Pirn winding, shape and build of the pirn, consistency of pirn diameter, bunch building, chase, winding and binding coils, spindle speed.</p>	4
4	Warping	<p>Introduction, passage of warp, warping creels, continuous chain creel, truck creel, magazine creel, efficiency of warping.</p> <p>Beam warping or direct warping, machines, Yarn tension in warping, leasing and beaming.</p> <p>Sectional warping, objectives, passage of warp, adjustable combs, measuring and marking, machine drive.</p> <p>Calculations related to beam and sectional warping.</p>	4
5	Sizing 1	<p>Introduction, sizing-weaving curve, size ingredients, preparation of the size paste, formulation and equipments.</p> <p>Chemistry of starch, linear and branched starch, cooking of starch, acid treatment of starch.</p> <p>Sizing agents for polyester, nylon and acetate, synthesis of PVA, properties of fully and partially hydrolysed PVA.</p> <p>Sizing machine elements, creel, over and under creel, equal tension creel, size box, 1 dip and 1 nip, 2 dip and 2 nip, squeeze rollers, factors influencing the pick up of size.</p>	4
6	Sizing 2	<p>Drying methods and systems, head stock, stretch in sizing, tension control mechanisms.</p> <p>Modern trends in sizing, single end sizing, prewetting, control of sizing parameters.</p>	4

		<p>Quality evaluation of sized yarns, criteria for assessment, tensile and abrasion properties, loom action abraders.</p> <p>Calculations related to production, size add on, size pick up and water evaporation.</p>	
7	Primary motions : Shedding	<p>Introduction of shedding mechanisms, distinct and indistinct shed, tappet, cam or tappet shedding, shedding with negative cams, purpose of using tappet shaft, movement ratio of tappet shaft, expression of lift of the tappets and calculation of strain in the warp from shed height.</p> <p>Dobby and jacquard shedding, rotary dobbie, single lift single cylinder jacquard, double lift single cylinder jacquard, double lift double cylinder jacquard, Verdol jacquard, types of shed.</p> <p>Designing of linear and SHM cam for shedding.</p> <p>Reversing mechanisms, positive shedding using grooved and matched cams, limitations of tappet shedding, heald staggering, geometry of the shed, depth of the shed, bending factor and effect of shed timing on bending factor.</p>	4
8	Primary motions : picking	<p>Introduction, different picking methods, shuttle picking, shuttle timing.</p> <p>Motion of shuttle during acceleration, catapult effect, nominal and actual displacement.</p> <p>Loom timing, relation between shuttle velocity and loom speed, loom width and rate of weft insertion, conventional picking mechanisms, classification, cone over pick, cone under pick, advantages and limitations.</p> <p>Parallel pick and link pick, expression for power required for picking, shuttle checking.</p>	4
9	Primary motions : beatup	<p>Movement of sley, beat up, sley eccentricity and the factors influencing it.</p> <p>Expressions related to sley displacement, velocity and acceleration.</p> <p>Effects of sley eccentricity on beat up force and timing available for shuttle flight. Effect of sley eccentricity on loom dynamics.</p> <p>Beat up force, weaving resistance, bumping conditions.</p>	4

10	Secondary and auxiliary motions & automatic looms	<p>Take up motions, objectives, negative and positive take up systems, five wheel, seven wheel and Shirley take up motions, design principles of take up systems for avoiding dangerous periodicities.</p> <p>Let off motions, negative and positive let off motions, tension variations.</p> <p>Auxiliary motions, weft stop motions, side fork and center fork motions, warp protector motions, loose reed and fast reed, warp stop motions.</p> <p>Automatic looms, weft feelers, bobbin change systems, weft mixing, drop box motions.</p>	4
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**References:**

1. Textile Mathematics by J. E. Booth (Volume III).
2. Yarn winding by Banerjee and Alagirusamy (NCUTE publication).
3. Textile Sizing by Goswami, Anandjiwala and Hall.
4. Weaving mechanism by Marks and Robinson (Textile Institute).
5. Weaving: Conversion of Yarn to Fabric by Lord and Mohamed.
6. Woven cloth construction by Robinson.