SYLLABUS FOR THE POST OF LECTURER (TECHNICAL)

Subject: TEXTILE CHEMISTRY

1. TEXTILE FIBRE:

Classification of textile fibres, essential requirements of fibre forming polymers; gross and fine structures of natural fibres like cotton, wool, silk; Introduction of bast fibres; Properties and uses of natural and man-made fibres including carbon, aramid and ultra-high molecular weight polyethylene fibres.

Molecular architecture, amorphous crystalline phase, glass transition, plasticization, crystallization, melting, factors affecting Tg and Tm; Polymerization of nylon-6, nylon-66, poly(ethylene terephthalate), polyacrylonitrile and polypropylene; Melt spinning processes for PET, polyamide and polypropylene; Preparation of spinning dope; Principles of wet spinning, dry spinning, dry-jet-wet spinning and gel spinning; Spinning of acrylic, viscose and other regenerated cellulosic fibres such as polynosic and lyocell; Post spinning operations such as drawing, heat setting, tow-to-top conversion; Spin finish composition and application; Different texturing methods.

Methods of investigating fibre structure such as density, x-ray diffraction, birefringence, optical and electron microscopy such as SEM and TEM, I.R. spectroscopy, thermal methods as DSC, DMA, TMA and TGA; Structure and morphology of man-made fibres; Mechanical properties of fibres; Moisture absorption of fibres; Fibre structure-property correlation.

2. FABRIC MANUFACTURE:

Weaving Preparation: Object and basic principles of working of winding, warping, drawing-in and sizing machines. Classification of weaving machines. Basic motions of Weaving: Primary, Secondary and Auxiliary Motions of weaving. Types of Shed, types of selvedges.
Fabric Structure: Methods of fabric presentation, weave repeat unit, drafts and lifting plan. Construction of elementary weaves e.g. plain, twill, satin and sateen weaves, Plain weave derivatives, weaves constructed on twill bases namely diamond, diaper, mock leno, Herring bone, waved and broken twills. Fundamental of knitting. Classification of knitting technologies, Difference between warp and weft knitting fabrics. Weft knitted constructions such as plain, rib, interlock and purl.

3. TEXTILE WET PROCESSING:

Pretreatment: Basic operations in textile wet processing – overall sequence, an overview of textile types and chemicals used, Singeing, Desizing, Scouring and Bleaching, Mercerization, Pretreatment of Blends.

Dyeing: Parameters of quality dyeing, Classification of dyes based on application, Performance characteristics of dyed textiles. Theories of dyeing e.g. Absorption, Electrochemical, Colloidal and Solid solution, free volume, static pore theory etc. Machinery for dyeing of textiles in various forms such as fibres, yarns, woven and knitted fabric and piece goods. Principle and methods of dyeing of natural and regenerated fibers with various classes of dyes e.g. Direct, Reactive, Vat, Sulphur, Basic, Acid, Azoic dyes. Dyeing of Synthetic fibre Polyester , Nylon, Acrylic and its blends with natural fibre. Different dyeing machines, development in dyeing machines. Dyeing of polyester with disperse dyes.

Printing: Introduction to various colouration techniques, Stages in the printing of textiles, and History of textile printing. Preparation of print paste, functions of various ingredients of print paste. Classification of thickeners and essential qualities of thickner, Preparation of stock thickening agents, Selection of thickening agents based on dye class.

Styles of Printing. Methods of printing such as block, screen printing(Flat bed and rotary), roller printing. Preparation of Screen for manual, flat bed and rotary screen printing machines Engraving of design on roller. Transfer printing of synthetic fabric and cotton Flock printing. Garment printing, Pigment printing, Various type of pigments, binders, catalysts, emulsion thickening agents. Faults in printing and their prevention. Application of Ink jet printing. CAD software, design preparation, colour reduction, colour separation, screen preparation. Digital printing.

Finishing of Textile: Objective of textile Finishing and types of finishing techniques, Mechanical finishes like Calendaring, sanforising. Different types of finishing process (Synthetic resin finish, anti shrink finish, Anti crease finish, organdi finish. silicone finishes, speciality finishes) Chemicals use in finishing - conventional softeners, stiffeners, binders, weighting agents etc. Heat setting of synthetic materials. Water proof finish, water repellent finish, fire proof finish, mildew finish, Wash & wear finish, Shiffon finish, Silicon finish and Creping.

Quality: Color fastness to light, washing, rubbing, sublimation, perspiration, end groups analysis in polyester and Nylon, oligomer content and spin finishes. Water quality for dyeing, effect of contaminants on textile wet processing, Water effluents testing. Hardness, solid content dissolved and suspended, pH, Color, Chloride, fluoride, Chemical oxygen demand (COD), Bio- chemical oxygen demand (BOD), Oil and grease content.
Conservation of water and steam in chemical processing of textiles. Different wastages in chemical processing of textiles,

4. TESTING:
Sampling techniques for fibres, yarns and fabrics; Sample size and sampling errors. Moisture in textiles; Identification of Textile fibre, Fibre length, fineness, crimp, maturity and trash content; Tensile testing of fibres; High volume fibre testing, Linear density of silver, roving and yarn; Twist and hairiness of yarn; Tensile testing of yarns; Evenness testing; Fault measurement and analysis of yarns.

Fabric thickness, compressibility, stiffness, shear, drape, crease recovery, tear strength, bursting strength, pilling and abrasion resistance; Tensile testing of fabrics; Objective evaluation of low stress mechanical characteristics; Air permeability; Wetting and wicking; Water-vapour transmission through fabrics; Thermal resistance of fabrics; Physical and chemical methods of fibre and blend identification and blend analysis.