

# Textile Chemistry

## Ph.D. Entrance Test Syllabus

### ENGINEERING MATHEMATICS

**Linear Algebra:** Matrices and Determinants; Systems of linear equations; Eigenvalues and Eigenvectors.

**Calculus:** Limit, continuity and differentiability; Successive differentiation; Partial differentiation; Maxima and minima; Errors and approximations; Definite and improper integrals; Sequences and series; Test for convergence; Power series; Taylor series.

**Differential Equations:** First order linear and non-linear differential equations; Higher order linear differential equations with constant coefficients; Euler-Cauchy equation; Partial differential equations; Wave and heat equations; Laplace's equation.

**Probability and Statistics:** Random variables; Poisson, binomial and normal distributions; Mean, mode, median, standard deviation; Confidence interval; Test of hypothesis; Correlation analysis; Regression analysis; Analysis of variance; Control charts.

**Numerical Methods:** Numerical solutions of linear and non-linear algebraic equations; Numerical integration by trapezoidal and Simpson's rules; Single-step and multi-step numerical methods for differential equations.

### TEXTILE PROCESSING

#### **Section 1: Textile Fibers / Fiber science**

Definition & Classification of Textile Fibers; Essential requirements of fiber forming polymers; Morphological and fine structure of natural fibers; Methods of investigation of fiber structure. Bast fibers and their purification processes; Introduction to man-made and synthetic fibers; Manufacturing process of man-made and synthetic fibers; Spinning of man-made and synthetic fibers; Post spinning processes like drawing, stretching and texturizing; Physical and chemical properties and end uses of textile fibers. Identification of textile fibers. Determination of blend compositions; Amorphous and crystalline phases; Molecular weight of polymer and its determination methods.

#### **Section 2: Pre-treatment of Textile Fibers:**

Chemical composition of raw natural fibers; Chemistry and process conditions of pre-treatment of cotton, wool, silk and bast fibers; Mercerization of cotton; Pre-treatment processes for man-made fibers and their blends; Pre-treatment machineries; Degradation of fibers associate with chemical pre-treatment processes; Assessment of damage of fiber due to chemical pre-treatment

processes. Auxiliaries and its advancement used in pre-treatment processes and their evaluation. Quality and Process control in pre-treatment.

**Section 3: Dyeing of Textile Fibers:**

Definition of dye and pigment; Classification of dyes; Colour and its constituents; Colour components; Theories of colour; Colour mixing laws; Dyeing of cellulosic, protein and man-made fibers with appropriate dyes; Dyeing of blended fabric; Auxiliaries and its advancement for dyeing and their evaluations; Dyeing machineries for textile fibers; Unconventional dyeing techniques; Garment dyeing; After-treatments of dyeing; Stripping of dyeing; Evaluation of colour fastness; Advancement in dyeing process and dyeing methodology. Quality and Process control in dyeing

**Section 4: Printing of Textile Fibers:**

Printing paste ingredients and their functions; Thickener used in printing; Difference between dyeing and printing; Styles of printing; Methods of printing; Preparation of screen for printing; Printing of cellulosic, protein and man-made fibers with appropriate dyes; Printing machineries; Transfer printing of polyester; Pigment printing; Digital printing; Garment printing; Auxiliaries and its advancement used in printing and their evaluation. Advancement in printing processes and printing methodology. Quality and Process control in printing.

**Section 5: Finishing of Textile Fibers:**

Definition and objects of finishing; Classification and types of finishing; Chemical finishing of textiles; Mechanical finishing of textiles; Heat-setting of synthetic fabrics; Low wet pick-up techniques for finishing; Advancement in finishing process and printing methodology. Assessment and evaluation of finishing agents. Quality and Process control in finishing.