

**COURSE DESCRIPTIONS for the Degree of Master of Science  
in Textile Engineering: Textile Chemistry and Fiber Science**

**19-12-503 Statistics & Research Methodology** 3 Cr. Probability distributions, tests of hypotheses, applications of T & F and chi-square distributions, analysis of variance, linear regression, statistical designs, application of software in statistics.

**19-14-509 Advanced Mathematics** 3 Cr. Properties of matrices theorems, numerical solution of linear and non-linear equations, numerical equation systems solutions, differential equations (constant coefficients in first and second orders), interpolation in one & two dimensional (regular and irregular space) and numerical integrals.

**34-12-500 Advanced Fibers Physics** 3 Cr. Moisture adsorption theories, Mechanical models of fibers, mechanical property theories, Haze and gloss in fibers, specific gravity of fibers and its relations to physical properties.

**34-12-502 Advanced Fiber Production Technology** 3 Cr. Introduction to synthetic fiber formation, solution properties and behaviour of melt polymers, engineering production of fibers from bi-components and side by side polymers, Fitz-Geralds theory for laminar flow of polymers, heat transfer in melt-spinning, coagulation in wet spinning, principles of fiber formation from synthetic fiber, linear viscoelastic behaviour of polymer melts, theory of tension and mechanism of molecular orientation and crystallinity of fibers plus advances high speed spinning.

**34-12-564 Advanced Finishing** 3 Cr. Anti-static finishing, anti-microbial finishing, soil release, optical brightening agents bleaching, coating and wool bleaching.

**34-12-560 Advanced Colorimetry** 3 Cr. Recent advances in colorimetry, limitation of color matching principles, color matching algorithms, metamerism indices, standard optical sources for colorimetry, standard methods for measurement of reflectance factor, colorimetry for fluorescent materials, color constancy, color difference formulae, measurements of whiteness, new development in color formulations, advanced color theories, color management.

**34-12-562 Mechanics and Dynamics of Textured Yarns** 3 Cr. A review on production methods of stretch and set yarns, innovation on false-twist texturing machines, quality control of texturing yarns containing on-line ,off-line, at-line methods, improvement of BCF machines , study on twist distribution on different parts of texturing machines, study on effect of twist rating variation in stairing, rectangularity and sinusoidal ,surging in false-twist texturing, study on tension ratio and produced torque for belt and disk twisting, calculation of zero slip in theoretical ,study on leaving torque and effect of it on structure of plain tricot fabric, study on effect of heat on relocation and reforming of filaments in false-twist texturing machines, comparison in heat behavior of nylon and polyester in false-twist texturing.

**34-12-586 Computer Programming in Textile** 3 Cr. Graphical concepts in textile engineering, digital image processing, application of system sources in software and system outgoing control, applicable graphical computer in textile, Lab View software, functional

toolboxes, virtual connection of objects, object orientation, concepts in simulation of textile process and systems, graphical modeling of textile process and systems.

**34-12-504 Data Processing in Textile** 3 Cr. Principles of image processing, principals of image enhancement, statistical analysis of image, image transformations (fourier transformation and its inverse, fast fourier transformation and its inverse, convolution, autocorrelation, power spectrum, angular power spectrum, Radius power spectrum), image restoration, review on applicable software in textiles.

**34-12-581 Advanced Coordination Chemistry** 3 Cr. Definitions, coordination theories, thermodynamics of formation of metal ion complexes, stability constants, relations between the complex properties and chelates, coordination number, reaction rate of transition metal, substitution and reduction oxidation reaction in coordination compounds, isomeric, stereo chemistry, photochemistry, study of electronic spectrum, magnetic properties, industrial applications of coordination of dyes, pigments and polymers.

**34-12-582 Advanced Spectroscopy** 3 Cr. Spectroscopy application in laboratory and industrial researches, select and design of spectroscopy methods in laboratory and industry, transform spectroscopy, photon count spectroscopy, photo acoustic spectroscopy, reflection spectroscopy, laser spectroscopy, raman spectroscopy, fluorescence and phosphorescence spectroscopy, ion and electron spectroscopy, light scattering spectroscopy, differential spectroscopy and automatic spectroscopy instruments.

**34-12-580 Advanced Textile Color Chemistry** 3Cr. In this subject various new Azo coloring materials, triphenyl methan, reactive, synthetic carbinoids, naphthaquinoid, mineral, organic and mineral-organic pigments, chemical and physical properties and application of pigments, size and size distribution of pigments in different systems, new colorants for application in textile, leather, edible material, paper printing, binders, resins, softeners and different kinds of coatings are studied.

**34-12-589 Chemistry of Surfactants** 3 Cr. Surfactant solubility thermodynamics, vanderwals forces, water and its physical structure, surfactants and their structures, surfactants classification, surfactant production method, emulsion, liquid crystal, source of surface tension, soil release, detergent and detergency, effective factors in detergency.

**34-12-583 Synthesis of Proteins** 3 Cr. Introduction, macromolecules role, nucleic acid, protein structure, protein operation, protein investigation methodology, keratin protein

**Advanced textile microscopy** 3 Cr. Electromagnet spectrum, geometric lighting, visible light and optical microscopes, polarized lighting, electron beam and electron microscopes, lenses and projection formation, microscopes classification, application and caring of microscopes, sample preparation methods, small section preparation, sample dyeing, dimension measurement, average measurement, material dimension, image preparation methods and analysis of microscopy samples, fiber identification, fiber damage, yarn and fabric property measurement, TEM & SEM and sample preparation and photo analysis, TEM & SEM application in textiles, investigation of fiber structure by X-ray.

**Advanced water and wastewater chemistry** 3 Cr. Physical and chemical properties of water, water preparation methods in textile and leather industries, waste material

characteristic on body life and environment, traditional filtration methods, filtration systems design of industrial wastewater, modern filtration methods F.B., B.R.D., air pollution and noise in textile factories.

**34-14-662 Special Subjects** 3 Cr. Result of new researches or subjects relating to textile chemistry, textile technology, fiber science, color science and so on.

**90-10-501 Seminar** 1 Cr. A review on new topics is presented orally by students.

**19-14-509 Project** 9 Cr. An original research in textile engineering and related fields resulting in a written dissertation.

## **COURSE DESCRIPTIONS for the Degree of Master of Science in Textile Engineering: Textile Technology**

### **COURSE DESCRIPTIONS**

**19-12-503 Statistics & Research Methodology in Textile** 3 Cr.  
Probability distributions, tests of hypotheses, applications of T & F and chi-square distributions, analysis of variance, Linear regression, Statistical designs, Application of software in statistics.

**19-14-509 Advanced Mathematics** 3 Cr. Properties of matrices theorems, numerical solution of linear and non-linear equations, numerical equation systems solutions, differential equations (constant coefficients in first and second orders), interpolation in one & two dimensional (regular and irregular space) and numerical Integrals.

**34-12-504 Data Processing in Textile** 3 Cr. Principles of image processing, principals of image enhancement, statistical analysis of image, image transformations (fourier transformation and its inverse, fast fourier transformation and its inverse, convolution, autocorrelation, power spectrum, angular power spectrum, radius power spectrum), image restoration, review on applicable software in textiles.

**34-14-600 Textile Physics** 3 Cr. This subject includes history of new textiles, micro fibers and their application, thermo storage fabrics, thermo regulating fabrics (PCM), water proof fabrics, deep color and anisotropic luster, high performance fibers and their applications, study of fibers length, tensile and dynamic properties of fibers, bending and thermal properties of textiles.

**34-14-602 Structural Mechanics of Yarn** 3 Cr. Evaluation of yarn structure, ideal yarn structure and compared to real yarn, fiber migration (concept, mechanism, role and importance, evaluation and measurement methods), stress analysis in yarn, elongation theory of filament yarn, stress analysis using energy method, theory of fiber blending (investigation of methods and processes, blend evaluation), yarn hairiness (concept, effective parameters, evaluation and control methods), study of bending and torsional behaviours of yarn, yarn compression analysis under load.

**34-14-604 Theories of Fabric Structure 3 Cr.** Fabric geometry, fabric dimensional properties considering to finishing steps, cover factor and related theories, fabric dimensional properties variation cause of conversion of different parameters like yarn density, fiber properties, blend yarns, fabric geometry variation cause of different weaving, fabric dimensional behavior effect of biaxial tension

**34-14-660 Theories of New Spinning Systems 3 Cr.** Open end spinning, repro self-twist spinning, twistless spinning, airjet spinning, sirospun spinning, dref spinning, friction spinning, hollow spindle spinning, cerifil yarns spinning, Fancy yarns spinning, rotating ring spinning, industrial yarns spinning.

**Weaving Dynamics 3Cr.** This subject includes cloth fell displacement during weaving, weaving resistance, weft yarn displacement during the weaving process, unbalanced shed, static and dynamic analysis of beating, effect of warp beam diameter on warp yarn tension during weaving, geometric of warp shed, analysis of multi linkage mechanisms, air flow analysis during weft insertion, Stress analysis on weft yarn during air jet weft insertion, water flow analysis during weft insertion.

**Knitting Dynamics 3Cr.** Analysis of forces on needle during weft knitting, analysis of forces on yarn in weft knitting, method of increasing production rate of weft knitting machines, cam designing of weft knitting machines.

**Design on Mechanisms 3Cr.** This subject includes study of linkages (velocity and acceleration in linkages, method of velocity and acceleration polygon drawing, synthesis of linkages, and review on textile mechanical mechanisms), cams (introduction to various types of cams, designing of cam curvature, introduction to various cam mechanisms and calculations of cams), and power transmission using gear boxes (analysis of simple and complex gear boxes, analysis of differentials).

**34-14-662 Special Subjects 3 Cr.** Result of new researches or subjects relating to textile chemistry, textile technology, fiber science, color science and so on.

**90-10-501 Seminar 1 Cr.** A review on new topics is presented orally by students.

**19-14-509 Project 9 Cr.** An original research in textile engineering and related fields resulting in a written dissertation.

## **COURSE DESCRIPTIONS for the Degree of PhD in Textile Engineering**

**34-12-700 Mechanics and Rheology of Fibers** 3 Cr. Creep, stress relaxation and viscoelastic coefficients in fibers, relation between creep and stress relaxation, mechanics and dynamics experiments, superposition principles, molecular explanation of viscoelastic properties of fibers, free volume and transitions theory, temperature of thermal transition of chemical parameters, statistical theory of molecular chain, rubber elasticity theory, viscoelastic models .

**34-12-702 New Methods of Fiber Spinning** 3 Cr. Alginate fibers, fibers produced from chitosan and chitosen polymers, fibers produced from thermo-set polymers, unusual spinning such as wet-dry spinning, solvent-melt spinning and gel spinning, fibrillation of fibers mechanism, microfibre production with high speed, spinning by using intense air flow, spinning by using faze separation, chemical spinning, spinning from emulsions, metals melt spinning, without spinneret spinning, spinning of flowing crystal polymers.

**34-12-705 Advanced Mechanics of Fibers and Yarn** 3 Cr. Mechanics principles, bending, torsion and compression behavior of fiber, fiber behavior under shear stress, fiber buckling, mechanical analysis of hollow fiber, fatigue, Hertzian contact stress, thermal stress, impact behavior of fibers, nano-fibre mechanics, principle and fundamentals in rupture mechanics, application and limitation of fiber rupture, classification and analysis of different types of fiber rupture, effect of environmental conditions on fiber rupture, mechanical behavior during thermal stresses, application of energy method to study crack propagation, relationship between residual strength and crack depth, dynamic investigation of crack propagation, various types of fiber damage and their effect on mechanical properties.

**34-12-706 Advanced Composites** 3 Cr. This subject includes definition and introduction to composites, classification of composites, application of thermoplastic and thermo-set polymers in composites, application of additives and fibers in reinforcing polymers, methods of production glass, carbon, kevlar, boron, ceramic, polyethylene and metal fibers, prepregs and performs methods of polymeric composite production, micro and macro mechanical analysis of continues and short fiber composites, destructive and non-destructive testing of composites for mechanical and physical characterization.

**34-12-708 Advanced Spectroscopy in Textiles** 3 Cr. Spectroscopy application in laboratory and industrial researches, select and design of spectroscopy methods in laboratory and industry, transform spectroscopy, futon count spectroscopy, photo acoustic spectroscopy, reflection spectroscopy, laser spectroscopy, Raman spectroscopy, fluorescence and phosphorescence spectroscopy, ion and electron spectroscopy, light scattering spectroscopy, differential spectroscopy and automatic spectroscopy instruments.

**34-12-712 Advanced Rheology** 3Cr. Introduction and primary definition, classification of non-Newtonian fluid, measurement principals of rheological properties by using rotating instruments and capillary tube rheometers, liner and non-liner viscoelastic materials, measurement principals of viscoelastic material properties, error sources in measurement instruments, laminar flow of non-Newtonian fluids, effective parameters on viscose laminar flow like temperature ,molecular weight, etc., extensional flow and its

measurement principles, rheological laws application in extruder, elastic parameters effective in melt polymeric materials flow.

**34-12-720 Chemistry of Surface Active Agents 3 Cr.** Surfactant solubility thermodynamics, vanderwals forces, water and its physical structure, surfactants and their structures, surfactants classification, surfactant production method, emulsion, liquid crystal, source of surface tension, soil release, detergent and detergency, effective factors in detergency.

**34-12-722 Advanced Physical Chemistry of Polymers 3Cr.** Low molecular liquid systems-polymers, polymeric solution thermodynamics, solubility and polymeric solution theories.

**34-12-724 Advanced Dyeing 3Cr.** In this subject application of physical chemistry, principles in dye absorption and diffusion and dyeing of fibers with different dyes is considered theoretically and practically. Also, novel methods of dyeing and their principle limitations are discussed widely.

**34-14-664 Advanced Mechanics and Physics of Fabric 3 Cr.** Wrinkle mechanism and comparison of wrinkle measurement in different methods, fabric drape, deformation of tubular and plane fabrics under compression load, weaving and knitting fabrics micromechanics, fabric energy formulas, compression curves analysis, fabric surface, effect of mechanical factors on surface geometry, abrasion mechanism, carpet structural mechanics.

**34-12-750 Special Topics in Textiles Chemistry (doctoral) 3Cr.** Result of new researches or subjects relating to textile chemistry, fiber science, and color science and so on.

**34-14-750 Special Topics in Textiles Technology (doctoral) 3Cr.** Result of new researches or subjects relating to textile technology.