

## UNDERGRADUATE COURSE DESCRIPTIONS- Textile Chemistry and Fiber Science

**34-12-226 Polymer Chemistry** 3 Cr. General properties of polymerization reactions, polycondensation reaction, chain polymerization, free-radical, cationic, anionic, stereo chemistry, copolymerization, other specialized methods of polymerization.

**34-12-228 Fiber Science** 2 Cr. **This topic includes classification of fibers, requirements** of fiber-forming polymers, general definition of fibers, general consideration with regard to fiber properties, production and structural properties of cellulosic, acetate, synthetic and non synthetic fibers.

**34-12-230 Textile Technology I** 2 Cr. Principles of short and long staple fibers, modern spinning systems, operating principles of relevant machineries, opening, cleaning, carding, blending, drawing, combing, flyer, ring and rotor spinning machines.

**34-12-300 Dyeing of Natural Fibers 1** 2 Cr. Classification of dyes and pigments, introduction to thermodynamic terms such as: adsorption, chemical potential, standard affinity, diffusion coefficient, activation energy, dyeing temperature, adsorption isotherms and dyeing rate. Study the dye fastness, dyeing of wool and cotton with different dyestuffs.

**34-12-302 Fiber Structure** 2 Cr. This topic considers study of fine structure of fibers and using characterization methods such as optical and polarized microscopy, SEM, TEM, AFM, WAX, SAX, thermal and IR spectroscopy.

**34-12-304 Textile Finishing I** 2 Cr. This topic includes Introduction to finishing, water softening methods, surfactants, preparation of finishing, chemical and mechanical treatments of cotton goods, application of finishing materials on fabric, different types of dryers and stenters used in textile industry, also finishing methods of blended fabrics with cotton.

**34-12-306 Textile Technology II** 2 Cr. This subject includes the principles of weaving machinery technology and different mechanisms such as shed formation, slay motion, warp let-off, and fabric take-up.

**34-12-308 Applied Thermodynamics** 3 Cr. This subject includes principles of heat and work, the laws of thermodynamics for closed and open systems, the phase behavior of pure fluids, equations of state, virial and cubic equations of state, generalized equations of state, heat effects, engines and refrigerators and properties of pure fluids.

**34-12-326 Dyeing of Man-made Fibers** 2 Cr. This topic discusses about dyeing of acetate, polyamide and polyurethane, polyester, acrylonitrile, polypropylene and blends of natural and manmade fibers with different dyestuffs including the theory and practice.

**34-12-328 Textile Finishing II** 2 Cr. This subject include mechanical and chemical finishing of wool and wool-blended fabrics, also chemical finishing in order to impart water repellency, flame retardancy, antimicrobial, insect resistancy as well as softening of textiles.

**34-12-330 Fiber Physics** 2 Cr. This subject includes study on molecular structure and physical properties of fibers such as length, fineness, density, moisture absorption, swelling, static and dynamic properties and thermal behavior.

**34-12-332 Fluid Mechanics** 3 Cr. This topic includes characterization of fluids, pressure, Static forces on surfaces, buoyancy, accelerations of motion, continuity, momentum and energy equation and their applications, measuring tools, dimensional and geometrical analysis, laminar and turbulent flows in pipes and open channels.

**34-12-334 Chemistry of Natural Fibers** 2 Cr. This subject includes chemical specification and derivatives of cellulose fibers, synthesis methods and applications, production of regenerated cellulose fibers and also chemical specification of animal fibers, active group protection, synthesis and chemistry of peptides and proteins, molecular structure of proteins and production of regenerated protein fibers.

**34-12-336 Principles of Chemical Engineering** 3 Cr. Material and energy balances, description of process equipment, fluid flow, heat transfer, distillation, absorption, humidification, drying, unit processes, economics and plant design.

**34-12-370 Non-Woven Textiles** 2 Cr. Introduction to non-wovens, classification of non-woven and their applications, web forming machinery, mechanical, chemical and thermal bonding methods, surface-structuring of non-wovens, advanced methods of non-woven fabric production of synthetic fibers.

**34-12-372 Production Management** 2 Cr. This subject discusses methods of decision making, forecasting, product design, plant location selection, facilities layout design, inventory management, JIT, quality assurance, total quality management.

**34-12-400 Dyeing, Printing and Finishing Techniques** 2 Cr. Classification and properties of thickening agents and printing auxiliaries, classification of printing methods, printing of cellulose, protein and synthetic goods, preparation of printing roller, flat and rotary screen and advanced methods of printing.

**34-12-402 Chemistry of Textile Auxiliaries** 2 Cr. In this subject method of production and applied properties of textile auxiliary materials is presented such as olefins, aromatic and paraffines which are produced through petrochemical processes.

**34-12-404 Technology of Fiber Production** 3 Cr. Production methods of fibers made from natural polymers such as viscose, Polynesia, diacetate and triacetate, alginate fibers also synthetic fibers such as polyamide, polyesters, elastomers, acrylics, modacrylics, PTFE and polyolefin's.

**34-12-426 Text rising** 2 Cr. Classification of texturing methods, properties of textured yarns made from conventional and simultaneous draw texturing methods, introduction to texturing machines, production of high bulk yarns and multi-component fibers and conversion methods of tows-to-tops.

**34-12-428 Principles of Color Technology** 2 Cr. This subject includes Introduction to light, color appearance, color order systems, one coordinate color systems, instrumental color measurement, structure of eye and vision and color matching.

**34-12-430 Chemistry of Dyes & Intermediates** 2 Cr. In this subject role of synthetic compound structure in coloring and change of hue, modification and synthesis dye stuff in dyeing of hydrophilic and hydrophobic fibers and industrial production of intermediate material with various reactions are discussed.

**34-12-476 Polymers Rheology** 2 Cr. In this subject classification of non-Newtonian fluids, experimental characterization, rotational and capillary viscometers, flow in pipes and channels, mixing characteristics, viscometer measurements and apparatus are discussed.

**15-10-157 Engineering Drawing I** 2 Cr. This course is about projection concepts, drawing standards, volume and surface analysis for drawing, the 3D view projection, Isometric and demetric (oblique & no oblique) projections, types of sectional views, industrial (assembly and workshop) drawings and dimensioning.

**16-10-216 Strength of Materials** 3 Cr. This title is about general concepts of tensile and compressor stress-strain, safety concepts, axial loading generalized Hooke's law, torsion of circular & non-circular members, pure bending, bending with axial forces and shear stress in beams.

**17-30-150 Computer Programming** 3 Cr. This course is introduction to computer, algorithm and flow chart, C language including arithmetic and logic expressions, data types, Input output statements, control statements, pointers, functions and recursive functions, arrays, subprograms, strings, records and files.

**17-10-250 Fundamentals of Electrical Eng.** 3 Cr. This subject is about resistive circuit, transient circuit, sinusoidal analysis, the fuzzy concept, the sinusoidal steady-state response, Fourier transform analysis, DC and AC transformers, transformer concept, DC Machine, AC Machine and synchronous machine.

**19-14-101 Calculus I** 4 Cr. Study of single variable calculus, numerical sequences, limits, continuity differentiation, extreme function values, the definite integrals and their applications, Inverse functions, logarithmic and exponential functions, inverse trigonometric and hyperbolic functions, techniques of integration, indeterminate forms, improper integrals, taylor's formulae, infinite series.

**19-14-102 Calculus II** 4 Cr. Study of several variable calculus: euclidean geometry matrices, linear transformation, elementary topology of  $R_n$ , derivative as linear operator, directional and partial derivatives, extreme function values, lagrange multiplier, multivariable and iterated integrals, change of variable theorem, parametric curves and surfaces, line integral, surface integral, vector analysis, green stokes and divergence theorem.

**19-14-251 Elementary Differential Equation** 3 Cr. Methods of solving especial classes of ordinary differential equation including linear, bernulli, separable and exact first order equation, reduction of order, variation of parameter, undetermined coefficients, power series methods, and laplacian transform methods in second order, linear

equation and autonomous system of linear differential equations, systems of first order and exponential matrix.

**19-12-291 Probability & Statistics For Engineering** 3 Cr. Probability as a set function on sample space, probability space, random variables, distribution functions, probability density function, mathematical expectation, chebyshev's inequality, conditional probability, independence. The transformations of variables of the discrete and continuous type and its generalizations. The moment generating function.

**20-10-115 Physics\** 3Cr. Vectors, motion in one and two dimensions, dynamics of a particle, work and energy, conservation of linear momentum, collisions, rotational kinematics and dynamics, oscillations. Fluid mechanics, heat and first law of thermodynamics, kinetic theory of gases, entropy and second law of thermodynamics.

**20-10-116 Physics Lab.I** 1Cr. Thermal expansion, heat conduction, specific heat, calorimetry, the mechanical equivalent of heat, surface tension.

**20-10-125 Physics II** 3Cr. Coulomb's law, electric field, Gauss' law, electric potential, capacitors, electromotive force and circuits, magnetic field, Ampere's law, Faraday's law.

**20-10-126 Electricity Physics Lab.** 1Cr. Measurement of resistivity, verification of Ohm's and Kirchoff's laws, study of capacitors, hysteresis curves, R-C and R-L circuits, oscilloscope, Biot and Savart's law.

**21-10-103 General Chemistry for Engineering** 3 Cr. Stereochemistry, gases thermo chemistry, atomic structure, solutions of acids and bases, electrochemistry, chemical kinetics.

**21-10-104 General Chemistry Lab I** 1 Cr. Experiments of Avogadro number, determination of molecular mass, mass conservation law, paper chromatography, ion concentration, acid and base titration, oxidation and reduction.

**21-12-125 Organic Chemistry I** 3 Cr. Structure and bonding, alkenes, alkenes, reactions and mechanisms, alkyl halides, stereochemistry, alkynes.

**21-12-231 Organic Chemistry II** 3 Cr. Electrophonic aromatic substitutions, baldheads, ketenes, alcohols, ethers, carboxylic acids and derivatives.

**21-18-295 Analytical Chemistry for Textile Engineers** 3 Cr. Acid-base, precipitation techniques, electrochemistry, spectroscopy.

**21-12-230 Organic Chemistry Lab I** 1 Cr. Experiments in synthesis, separation and identification of organic materials.

**21-14-263 Physical Chemistry for Textile** 1 Cr. Thermodynamics laws, solutions - kinetics, quantum chemistry, macromolecule physical chemistry.

**21-18-298 Analytical Chemistry Lab for Textile** 1 Cr. Experiments in precipitation, complexometry, electrochemistry, volumetric and gravimetric.

**21-14-264 Physical Chemistry Lab for Textile** 1 Cr. Experiments in chemical kinetics, adsorption, equilibrium constants, phase diagrams. Conductometry, MW determination of macromolecules.

**25-10-111 English for engineering students** 3 Cr. Introduces students to the basic vocabulary of engineering; improves reading skills through exposure to readings from different fields of engineering; includes advanced grammar instruction.

### **UNDERGRADUATE COURSE DESCRIPTIONS- Textile Technology**

**34-14-200 Principles of Polymer Structure** 2 Cr. This subject is about basic definitions and nomenclature, molar mass and degree of polymerization, classification of polymerization reactions, morphology, crystalline melting temperature, glass transition temperature, solubility of polymers, mechanical properties, application of polymers and additives.

**34-14-226 Fiber Science** 2 Cr. This topic includes classification of fibers, requirements of fiber-forming polymers, general definition of fibers, general consideration with regard to fiber properties, production and structural properties of cellulosic, acetate, synthetic and non synthetic fibers.

**34-14-228 Spinning of Short- Staple Fibers I** 2 Cr. This subject includes the main characteristics of short staple fibers, spinning systems classification, counting system, mechanisms of spinning process including blow-room and carding, and theory of interaction between fiber and machine part.

**34-14-310 Spinning of Short-Staple Fibers II** 3 Cr. This course is about principles of draw frame system, combing preparation, combing mechanism and setting, flyer and ring spinning machine, mechanism of drafting, twisting and winding.

**34-14-312 Weaving Preparation** 2 Cr. This subject includes principles of winding technology, sizing, beaming systems and methods, cone winding, bobbin winding, pirn winding and heat setting of yarn twist.

**34-14-314 Design of Machine Elements I** 3 Cr. This course is about design principles, stress - strain analysis, design of static strength, stress concentration, failure theories. fatigues, shafts and couplings, screws, threaded fasteners, rivets, welds and springs.

**34-14-326 Fiber Physics** 2 Cr. This subject includes study on molecular structure and physical properties of fibers such as length, fineness, density, moisture absorption, swelling, static and dynamic properties and thermal behavior.

**34-14-328 Weaving I** 2 Cr. In this course weaving process, the theoretical aspect of the shedding mechanism, cam dobbie and jacquard, timing diagram of weaving machinery and technological trend of them is discussed in details.

**34-14-330 Modern Spinning** 2 Cr. This subject includes new spinning systems: rotor spinning, friction spinning, air jet spinning, hallow spindle, etc, machinery classification, yarn structure in various systems, physical and mechanical properties of yarns, theoretical aspect, operating principles, capabilities and limitations.

**34-14-332 Weaving Techniques** 3 Cr. This subject includes general principles of fabric structures, varieties and essential features of weaves such as plain, twill, double faced, loop pile fabrics, different methods of draw-in of weaving machinery and design paper of shedding mechanisms.

**34-14-334 Weft Knitting** 3 Cr. This subject is about weft knitted fabric properties and their structure, knitting elements, types of different loop formation and their effects on the fabric, machinery classification, flat, circular and double cylinder and mechanism of flat, circular and double cylinder knitting machine, pattern systems, loop transfer, structure geometry and fabric defects.

**34-14-336 Conditioning in Textile Mills** 2 Cr. This course is about Interactions between heat and moisture, heat and moisture generation techniques, waste of heat, central conditioning, calculations of pressure drop, behavior of various fibers in processing due to moisture and heat, conditioning of synthetic and natural fibers.

**34-14-400 Spinning of Continues Yarns** 2 Cr. Classification of texturing methods, properties of textured yarns made from conventional and simultaneous draw texturing methods, introduction to texturing machines, production of high bulk yarns and multi-component fibers and conversion methods of tows-to-tops.

**34-14-402 Weaving II** 2 Cr. This subject includes the principle of let-off and take-up mechanisms, different methods of weft insertion namely projectile, water jet, air jet, and rapier, checking mechanisms, structure of woven fabrics and their parameters.

**34-14-404 Fabric Analysis** 2 Cr. This subject includes weaving process calculations, yarn beaming, sizing process calculations, woven fabric construction calculations, greige fabric analysis and identification of different woven fabrics.

**34-14-406 Warp Knitting** 3 Cr. The structure of warp knits, machinery classifications, basic designing principles and lapping movements, tricot knitting technology, Rachel knitting technology, yarn preparation and warping and warping calculations.

**34-14-408 Statistical Quality Control of Textiles** 3 Cr. This subject includes review of statistics, textile testing, confidence limit, warning limits, test on the fiber, the yarn and the fabric, irregularities of textile materials (sliver, roving and yarn), analysis of irregularities and detecting of source of defects.

**34-14-410 Dyeing, Printing and Finishing** 3 Cr. This course is about water purification, classification of dyes, principles of dyeing of natural and synthetic fibers, yarns and fabrics, techniques of printing, finishing of cotton, woolen and worsted fabrics.

**34-14-426 Mill Planning** 2 Cr. This subject includes production design, transportation, location decision, basic and cellular layouts, line balancing, process layout, job design operations strategy, inventory design and packaging.

**34-14-428 Spinning of Long Staple Fibers** 2 Cr. This subject is about animal fibers and their classification, wool preparation, long staple spinning systems and their differences, wool spinning mechanism, worsted and semi worsted mechanism and different methods of tow to tops conversion.

**34-14-470 Non-Woven Textiles** 2 Cr. Introduction to non-wovens, classification of non-woven and their applications, web forming machinery, mechanical, chemical and thermal bonding methods, surface-structuring of non-wovens, advanced methods of non-woven fabric production of synthetic fibers.

**34-14-472 Production Operation Management** 2 Cr. This subject discusses methods of decision making, forecasting, product design, plant location selection, facilities layout design, inventory management, JIT, quality assurance, total quality management.

**34-14-476 Clothing** 2 Cr. Improvement in cloth production by industrial methods, instruments of material cutting and transferring, press and finishing instruments, necessary equipment for commodity storing, cloth design, management techniques in cutting and sewing salon, quality control in sewing salon, workers training in cloth industries, expenses estimation and pricing, sales formation and marketing.

**15-10-157 Engineering Drawing I** 2 Cr. This course is about projection concepts, drawing standards, volume and surface analysis for drawing, the 3D view projection, Isometric and demetric (oblique & nonoblique) projections, types of sectional views, industrial (assembly and workshop) drawings and dimensioning.

**16-12-212 Strength of Materials** 3 Cr. This title is about general concepts of tensile and compressor stress-strain, safety concepts, axial loading generalized Hooke's law, torsion of circular & non-circular members, pure bending, bending with axial forces and shear stress in beams.

**16-10-104 Statics** 3 Cr. This course is about vector algebra, equations of forces equilibrium, reaction of supports, bi and three dimensional truss, structures, force distribution, static and dynamic friction, moments and products of inertia of different surfaces.

**16-10-208 Dynamics** 3 Cr. This subject includes dynamics of particles & rigid bodies at general plane motion including kinematics, dynamic equilibrium, work & energy, and impulse & momentum.

**19-14-101 Calculus I** 4 Cr. Study of single variable calculus, numerical sequences, limits, continuity differentiation, extreme function values, the definite integrals and their applications, Inverse functions, logarithmic and exponential functions, inverse trigonometric and hyperbolic functions, techniques of integration, indeterminate forms, improper integrals, taylor's formulae, infinite series.

**19-14-102 Calculus II** 4 Cr. Study of several variable calculus: euclidean geometry matrices, linear transformation, elementary topology of  $R_n$ , derivative as linear operator, directional and partial derivatives, extreme function values, lagrange multiplier, multivariable and iterated integrals, change of variable theorem, parametric curves and surfaces, line integral, surface integral, vector analysis, green stokes and divergence theorem.

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**20-10-115 Physics1** 3Cr. Vectors, motion in one and two dimensions, dynamics of a particle, work and energy, conservation of linear momentum, collisions, rotational kinematics and dynamics, oscillations. Fluid mechanics, heat and first law of thermodynamics, kinetic theory of gases, entropy and second law of thermodynamics.

**20-10-116 Physics Lab. I** 1Cr. Thermal expansion, heat conduction, specific heat, calorimetry, the mechanical equivalent of heat, surface tension.

**20-10-125 Physics II** 3Cr. Coulomb's law, electric field, Gauss' law, electric potential, capacitors, electromotive force and circuits, magnetic field, Ampere's law, Faraday's law.

**20-10-126 Electricity Physics Lab.** 1Cr. Measurement of resistivity, verification of Ohm's and Kirchoff's laws, study of capacitors, hysteresis curves, R-C and R-L circuits, oscilloscope, Biot and Savart's law.

**21-10-103 General Chemistry for Engineering** 3 Cr. Stereochemistry, gases thermo chemistry, atomic structure, solutions of acids and bases, electrochemistry, chemical kinetics.

**21-10-104 General Chemistry Lab I** 1 Cr. Experiments of Avagadro number, determination of molecular mass, mass conservation law, paper chromatography, ion concentration, acid and base titration, oxidation and reduction.

**19-14-271 Numerical Calculation** 2 Cr. This subject includes errors and the sources, solving non-linear equations, solving systems of linear and non-linear equations, interpolation, numerical differentiation and integrations and solving ordinary differential equations.



**25-10-111 English for Engineering Students** 3 Cr. Introduces students to the basic vocabulary of engineering; improves reading skills through exposure to readings from different fields of engineering; includes advanced grammar instruction.