



**ANNA UNIVERSITY**  
**Chennai-25.**  
**Syllabus for**

**B.Tech. Textile Chemistry**

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**CM125 Chemistry I** **3** **0** **0** **100**

**1. CHEMICAL THERMODYNAMICS** **9**

Definition of free energy and spontaneity - Maxwell relations - Gibbs-Helmholtz equation - Van't Hoff equations - Stoichiometry and energy balances in Chemical reactions.

**2. DYNAMICS OF CHEMICAL PROCESSES** **10**

Basic concepts - composite reactions (opposing, parallel and consecutive reactions) - Collision theory - Thermodynamic formulation of reaction rates - unimolecular reactions - Chain reactions (Stationary and non-stationary) - Enzyme Kinetics - Michaelis - Menten Equation.

**3. ELECTRODICS** **8**

Types of electrodes and cells - Nernst Equation - emf measurement and its applications - Principles of chemical and electrochemical corrosion - corrosion control (Sacrificial anode and impressed current methods).

**4. WATER** **8**

Water quality parameters - Definition and expression - Estimation of hardness (EDTA method) - Alkalinity (Titrimetry) - Water softening (zeolite) - Demineralisation (Ion-exchangers) and desalination (RO) - Domestic water treatment.

**5. POLYMERS** **10**

Monomer - Functionality - Degree of polymerisation - Classification based on source and applications - Addition, Condensation and copolymerisation - Mechanism of free-radical polymerisation - Thermoplastics and thermosetting plastics - Processing of plastics - Injection moulding, blow moulding and extrusion processes.

**Total No of periods: 45**

*Text Books:*

1. Alkins P.W., " *Physical Chemistry* ", ELBS, IV Edition, 1998, London.

*References:*

1. Balasubramanian M.R., Krishnamoorthy S. and Murugesan V., " *Engineering Chemistry* ", Allied Publisher Limited., Chennai, 1993.
2. Karunanidhi M., Ayyaswamy N., Ramachandran T and Venkatraman H., " *Applied Chemistry* ", Anuradha Agencies, Kumbakonam , 1994.
3. Sadasivam V., " *Modern Engineering Chemistry - A Simplified Approach* ", Kamakya Publications, Chennai , 1999.
4. Kuriakose, J.C. and Rajaram J., " *Chemistry in Engineering and Technology* ", Vol. I and II, Tata McGraw-Hill Publications Co.Ltd, New Delhi ,1996.
5. Jain P.C. and Monica J., " *Engineering Chemistry* ", Dhanpat Rai Publications Co.,(P) Ltd., New Delhi, 1998.

**1. BASICS 5**

Introduction - Units and Dimensions - Laws of Mechanics - Vectors - Vectorial representation of forces and moments - Vector operations.

**2. STATICS OF PARTICLES 8**

Coplanar Forces - Resolution and Composition of forces - Equilibrium of a particle - Forces in space - Equilibrium of a particle in space - Equivalent systems of forces - Principle of transmissibility - single equivalent force.

**3. EQUILIBRIUM OF RIGID BODIES 7**

Free body diagram - Types of supports and their reactions - requirements of stable equilibrium - Equilibrium of Rigid bodies in two dimensions - Equilibrium of rigid bodies in three dimensions.

**4. PROPERTIES OF SURFACES AND SOLIDS 12**

Determination of Areas and Volumes - First moment of area and the centroid - second and product moments of plane area - Parallel axis theorems and perpendicular axis theorems - Polar moment of inertia - Principal moments of inertia of plane areas - Principal axes of inertia - Mass moment of inertia - relation to area moments of inertia.

**5. FRICTION 4**

Frictional Force - Laws of Coloumb friction - Simple Contact friction - Rolling Resistance - Belt Friction.

**6. DYNAMICS OF PARTICLES 16**

Displacement, Velocity and acceleration their relationship - Relative motion - Curvilinear motion - Newton's Law - Work Energy Equation of particles - Impulse and Momentum - Impact of elastic bodies.

**7. ELEMENTS OF RIGID BODY DYNAMICS 8**

Translation and Rotation of Rigid Bodies - Velocity and acceleration - General Plane motion - Moment of Momentum Equations - Rotation of rigid Body - Work energy equation.

**Total No of periods: 60**

*Text Books:*

1. *Beer and Johnson, " Vector Mechanics for Engineers ", Vol. 1 " Statics " and Vol. 2 " Dynamics ", McGraw Hill International Edition, 1995.*
2. *Merriam, " Engineering Mechanics ", Vol.1 " Statics " and Vol.2 " Dynamics 2/e ", Wiley International, 1988.*

*References:*

1. *Rajasekaran S. and Sankara Subramanian, G., " Engineering Mechanics - Statics and Dynamics ".*
2. *Irving, H., Shames, " Engineering Mechanics - Statics and Dynamics ", Thrid Edition, Prentice-Hall of India Pvt.Ltd., 1993.*
3. *Mokoshi, V.S., " Engineering Mechanics ", Vol.1 " Statics " and Vol.2 " Dynamics ", Tata McGraw Hill Books, 1996.*
4. *Timoshenko and Young, " Engineering Mechanics ", 4/e, McGraw Hill, 1995.*
5. *McLean, " Engineering Mechancis ", 3/e, SCHAUM Series, 1995.*

(Revised Syllabus For B.E. / B.Tech. Programmes - Effective From June 2002)

<b>1. MATRICES</b>	<b>9</b>
Characteristic equation - Eigen values and eigen vectors of a real matrix. Some properties of eigen values, Cayley-Hamilton theorem, Orthogonal reduction of a symmetric matrix to diagonal form - Orthogonal matrices - Reduction of quadratic form to canonical form by orthogonal transformation.	
<b>2. THREE DIMENSIONAL ANALYTICAL GEOMETRY</b>	<b>9</b>
Direction cosines and ratios - Angle between two lines - Equation of a plane - Equation of a straight line - Coplaner lines - Shortest distance between skew lines - Sphere - Tangent plane - Plane section of a sphere - orthogonal spheres.	
<b>3. GEOMETRICAL APPLICATIONS OF DIFFERENTIAL CALCULUS</b>	<b>9</b>
Curvature - cartesian and polar coordinates - Circle of curvature - Involutives and Evolutives - Envelopes - properties of envelopes - Evolute as envelope of normals.	
<b>4. FUNCTIONS OF SEVERAL VARIABLES</b>	<b>9</b>
Functions of two variables - Partial derivatives - Total differential - Differentiation of implicit functions - Taylor's expansion - Maxima and Minima - Constrained Maxima and Minima by Lagrangean Multiplier method - Jacobians - differentiation under integral sign.	
<b>5. ORDINARY DIFFERENTIAL EQUATIONS</b>	<b>9</b>
Simultaneous first order linear equations with constant coefficients - Linear equations of second order with constant and variable coefficients - Homogeneous equation of Euler type - equations reducible to homogeneous form - Method of reduction of order - Method of variation of parameters.	
<b>6. TUTORIAL</b>	<b>15</b>

**Total No of periods: 60**

*Text Books:*

1. Kreyszig, E., " *Advanced Engineering Mathematics* " (8th Edition), John Wiley and Sons (Asia) Pte Ltd., Singapore, 2001
2. Veerarajan, T., " *Engineering Mathematics* ", Tata McGraw Hill Publishing Co., NewDelhi, 1999.

*References:*

1. Grewal, B.S., " *Higher Engineering Mathematics* " (35th Edition), Khanna Publishers, Delhi , 2000.
2. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., " *Engineering Mathematics* ", Volume I (4th Revised Edition), S. Chand & Co., New Delhi, 2000.
3. Narayanan, S., Manicavachagom Pillay, T.K., Ramanaiah, G., " *Advanced Mathematics for Engineering Students* ", Volume I (2nd Edition), S. Viswanathan (Printers & Publishers), 1992.
4. Venkataraman, M.K. " *Engineering Mathematics - First year* " National Publishing Company, Chennai (2nd Edition), 2000.

<b>1. PROPERTIES OF MATTER</b>	<b>9</b>
Elasticity - stress-strain diagram-factors affecting elasticity - Twisting couple on a wire-Shafts-Torsion pendulum-Depression of a cantilever- Young's modulus by cantilever-Uniform and Non Uniform bending-I shape girders-Production and measurement of high vacuum-Rotary pump-Diffusion pump-Pirani Gauge-Penning gauge-Viscosity-Oswald Viscometer-Comparision of viscosities.	
<b>2. ACOUSTICS</b>	<b>9</b>
Acoustics of buildings-Absorption coefficient-Intensity-Loudness-Reverberation time-Sabine's formula-Noise pollution-Noise control in a machine-Ultrasonics-production-Magnetostriction and Piezoelectric methods-Applications of ultrasonics in Engineering and Medicine.	
<b>3. HEAT AND THERMODYNAMICS</b>	<b>9</b>
Thermal conductivity-Forbe's and Lee's Disc methods-Radial flow of heat-Thermal conductivity of rubber and glass-Thermal insulation in buildings-Laws of thermodynamics-Carnot's cycle as heat engine and refrigerator-Carnot's theorem-Ideal Otto and Diesel engines-Concept of entropy-Entropy Temperature diagram of carnot's cycle.	
<b>4. OPTICS</b>	<b>9</b>
Photometry-Lummer Brodhum photometer-Flicker Photometer-Antireflection coating-Air wedge-Testing of flat surfaces-Michelson's Interferometer and its applications-Photoelasticity and its applications-Sextant-Metallurgical microscope-Scanning electron microscope.	
<b>5. LASER AND FIBRE OPTICS</b>	<b>9</b>
Principle of lasers-laser characteristics-Ruby-NdYAG, He-Ne, CO <sub>2</sub> and semiconductor lasers-propagation of light through optical fibers-types of optical fibre-Applications of optical fibres as optical waveguides and sensors.	

**Total No of periods: 45**

*Text Books:*

*1. Arumugam.M., " Engineering Physics ", Anuradha Publications, 1998.*

*References:*

- 1. Resnik R. and Halliday D., " Physics ", Wiley Eastern, 1986.*
- 2. Nelkon M. and Parker.P., " Advanced Level Physics ", Arnald-Heinemann, 1986.*
- 3. Vasudeva A.S., " Modern Engineering Physics ", S. Chand and Co., 1998..*
- 4. Gaur, R.K., and Gupta, S.L., " Engineering Physics ", Dhanpat Rai and Sons, 1988.*
- 5. Mathur, D.S, " Elements of properties of Matter ", S.Chand & Co., 1989.*

**30**

1. Preparation of standard solutions.
2. Estimation of hardness of water by EDTA method
3. Estimation of different types and amounts of alkalinity in water - Indicator method
4. Determination of dissolved oxygen - Winkler's method.
5. Estimation of iron in water - Spectrophotometric method.
6. Estimation of sodium in water - Flame Photometric method
7. Determination of molecular weight of polymers-Viscometric method.
8. Determination of total dissolved solids in water.
9. Corrosion experiments:
  - \* Corrosion rate measurements
  - \* Inhibition efficiency.
10. Electrochemistry experiments:
  - \* Determination of emf.
  - \* Single electrode potential
  - \* Potentiometric and conductometric titration

**Total No of periods: 30**

**1. FUNDAMENTALS OF COMPUTERS AND OPERATING SYSTEMS 4**

Evolution of Computers - Organization of Modern Digital Computers-Single user Operating System-  
Multitasking OS-GUI

**2. OFFICE AUTOMATION 11**

- a) Word Processing
- b) Data Base Management System
- c) Spread Sheet Package
- d) Presentation Software

**3. PRACTICALS 45**

**Total No of periods: 60**

*Text Books:*

1. Ghosh Dastidar, Chattopadhyay and Sarkar, " Computers and Computation - A Beginner's Guide ",  
Prentice Hall of India, 1999.

*References:*

1. Nelson, Microsoft Office 97, Tata McGraw Hill, 1999.
2. Taxali, " PC Software for Windows Made Simple ", Tata McGraw Hill, 1999.

**GE133 Workshop Practice**

**0 0 4 100**

**1. SHEET METAL 10**

Tools and Equipments - Fabrication of tray, cone, etc., with sheet metal

**2. WELDING 10**

Tools and Equipments - Arc Welding of butt joint, Tap Joint, Tee fillet etc., Demonstration of gas welding.

**3. FITTING 10**

Tools and Equipments- Practice in Chipping, Filing, Drilling - making Vee joints, square and dove tail joints.

**4. CARPENTRY 10**

Tools and Equipments-Planning Practice-making halving joint and dove tail joint models.

**5. FOUNDRY 10**

Tools and Equipments Preparation of moulds of simple objects like flange, gear V- grooved pulley etc.

**6. SMITHY 10**

Tools and Equipments - Demonstration for making simple parts like keys, bolts etc.

**Total No of periods: 60**

*References:*

1. Venkatachalapathy V.S., " *First Year Engineering Workshop Practice* ", Raamalinga Publications, Madurai, 1999.
2. Kanaiah P.and Narayana K.C., " *Manual on Workshop Practice Scitech Publications* ", Chennai, 1999.

**1. PRACTICALS**

**30**

1. Young's modulus by non uniform bending.
2. Rigidity modulus and moment of inertia using Torsion Pendulum
3. Viscosity of a liquid by Poiseuille's method.
4. Wavelength determination using grating by Spectrometer.
5. Particle size determination by Laser
6. Thermal conductivity by Lees' disc.
7. Thickness of wire by Air wedge.
8. Thermo emf measurement by potentiometer.

**Total No of periods: 30**

**1. ENVIRONMENTAL POLLUTION 8**

Causes of pollution - Water pollution - Domestic, industrial and agricultural wastes - Assessment of pollution - D.O., B.O.D. and C.O.D. Treatment - Primary and secondary - sludge disposal - Air pollution - Environmental impact - Acid rain, green house effect and global warming - Ozone depletion Smog - Control measures - Soil and Noise pollution.

**2. FUELS 10**

Classification of fuels - Calorific value - determination - Coal - Ranking and analysis - Carbonisation of coal - Coal tar products - Metallurgical coke - Classification of Petroleum - Fractional distillation - Cracking - Reforming - Petrol - Diesel - Coal gas - Natural gas - Producer gas - LPG - Biogas.

**3. BINDING MATERIALS 6**

Cement and lime - Types - Composition and characteristics - Chemistry of setting and hardening - Grading and analysis - Adhesives - Types - Characteristics Epoxides, urethanes, polyvinyl alcohol and polyvinyl acetate.

**4. POLYMERIC MATERIALS 10**

Polytetrafluoroethylene, Polyamides (nylon 6, nylon 66, Kevlar), Polyesters (polyethylene terephthalate, polybutyleneterephthalate, aromatic polyester) polycarbonate, polyacetals, polysulphoes (applications only, manufacturing details not required) Composites: Matrix resins - Reinforcements - Applications.

**5. INDUSTRIAL INORGANIC COMPOUNDS 11**

Zeolites : Types - Applications - Ion exchange - Adsorbent - Separation process -Catalyst.

Pigments : Titanium dioxide - Lithophone - Zinc Oxide - Iron oxide - Ultramarine.

Bleaching agents : Reducing bleaching agents - Sulphur dioxide - Sodium hydrosulphite - Oxidizing bleaching agents - Calcium hypochlorite - Hydrogen peroxide - Chlorine dioxide.

Refractory: Silicon carbide - aluminium oxide - Ultramarine.

Lubricants : Silicone oil - Lithium grease - Graphite - Molybdenum disulphide.

**6. PRACTICALS 30**

Phenol water system - Kinetics of Ester Hydrolysis - Distribution Coefficient - Pigment analysis: Lead and Titanium - Melting point and Molecular weight Determination - Estimation of percentage composition of Glycerol (Viscometric method)

**Total No of periods: 75**

*References:*

1. *Kuriacose J.C., & Rajaram, J., " Chemistry in Engineering and Technology ", Volume 1 & 2, Tata McGraw Hill Publishing Co., Ltd., New Delhi, 1989.*
2. *Jain, P.C., " Engineering Chemistry ", Revised and Enlarged Edition, Dhanpat Rai and Sons., New Delhi, 1990.*
3. *Puri P.C. and Sharma L.R., " Principles of Physical Chemistry ", Shoban Lal Naginchand and Company, Delhi, 1994.*
4. *Raymond B.Seymour, " Engineering Polymer source Book ", McGraw Hill Publishing Co., New York, 1990.*
5. *Miles D.C. and Briston J.H., " Polymer Technology ", Chemcial Publishing Co., Inc.,*
6. *Gopalan R., Venkappayya D. and Nagarajan S., " Engineering Chemistry ", Vikas Publishing House Pvt.Ltd., New Delhi, 1999.*

<b>1. SEMICONDUCTORS AND RECTIFIERS</b>	<b>9</b>
Classification of solids based on energy band theory - Intrinsic semiconductors - Extrinsic semiconductors - P type and N type - P-N junction - VI characteristic of PN junction diode - Zener effect - Zener diode - Zener diode characteristic - Half wave and full wave rectifiers - Voltage regulation.	
<b>2. TRANSISTORS AND AMPLIFIERS</b>	<b>9</b>
Bipolar Junction Transistor - CB, CE, CC - Configurations and characteristics - Biasing circuits - Elementary treatment of voltage amplifier - Class A, B and C power amplifiers - principles of Tuned amplifiers.	
<b>3. POWER AND CONTROL ELECTRONIC DEVICES</b>	<b>9</b>
Field Effect Transistor - Configurations and characteristics - FET amplifier - SCR, Diac, Triac, UJI - Characteristics and simple applications - switching transistors - concept of feed back - negative feed back - application in temperature and motor speed control.	
<b>4. SIGNAL GENERATORS AND LINEAR IC'S</b>	<b>9</b>
Sinusoidal oscillators - positive feed back - RC phase shift, Hartley, Colpitt's, Wien bridge Oscillators - multivibrators - operational amplifier - adder, multiplier, integrator and differentiators - Integrated circuits.	
<b>5. DIGITAL ELECTRONICS</b>	<b>9</b>
Binary number system - AND, OR, NOT, NAND, NOR circuits - Boolean algebra - Exclusive or gate - Half and full adders - flip flops - registers and counters - A/D, D/A conversion - Digital computer principle.	
<b>6. TUTORIAL</b>	<b>15</b>

**Total No of periods: 60**

*Text Books:*

1. *Milman and Halkias, " Integrated Electronics ", McGraw Hill, 1979.*

*References:*

1. *Mehta,V.K., " Principles of Electronics ", S.Chand and Company Ltd., 1994.*

2. *Malvino & Leach, " Digital Principles and Applications ", McGraw Hill, 1986.*

**1. ELECTRICAL CIRCUITS 9**

Ohms Law - Kirchoff's Laws - steady state solution of DC circuits - Introduction to AC circuits - Waveforms and RMS value - power and power factor, single phase and 3 phase balanced circuits.

**2. ELECTRICAL MACHINES 15**

Principles of operation and characteristics of DC machines, Transformers (single phase and three phase) - Synchronous Machines - 3 Phase and single phase Induction motors - (op. principles).

**3. ELECTRICAL MEASUREMENTS 6**

Moving coil and moving iron instruments (Ammeter and Voltmeter) Dynamometer type watt meters and energy meters (op. principles).

**4. PRACTICAL 30****Total No of periods: 60***Text Books:*

1. Mittle, V.N., " Basic Electrical Engineering ", TMH Edition, New Delhi, 1990.
2. Del Toro, " Electrical Engineering Fundamentals ", Prentice Hall of India Pvt.Ltd., New Delhi, Second Edition.

*References:*

1. Jimmie J.Cathey and Nasar, S.A., " Basic Electrical Engineering ", Schaurn outline series in Engineering, McGraw Hill Book Co.1987.
2. Deshpande, N.V., " Electrical Machines " A.A.Wheeler and Co. Ltd., New Delhi, 1994.

(Revised Syllabus For B.E. / B.Tech. Programmes - Effective From June 2002)

- 1. MULTIPLE INTEGRALS 9**  
 Double integration in Cartesian and polar coordinates - Change of order of integration - Area as a double integral - Triple integration in Cartesian coordinates - Change of variables - Gamma and Beta functions.
- 2. VECTOR CALCULUS 9**  
 Curvilinear coordinates - Gradient, Divergence, Curl - Line, surface & volume integrals - Statements of Green's, Gauss divergence and Stokes' theorems - Verification and applications.
- 3. ANALYTIC FUNCTIONS 9**  
 Cauchy Riemann equations - Properties of analytic functions - Determination of harmonic conjugate - Milne-Thomson's method - Conformal mappings : Mappings  $w = z + a$ ,  $az$ ,  $1/z$ ,  $z^2$  and bilinear transformation.
- 4. COMPLEX INTEGRATION 9**  
 Cauchy's theorem - Statement and application of Cauchy's integral formulae - Taylor's and Laurent's expansions - Singularities - Classification - Residues - Cauchy's residue theorem - Contour integration - Circular and semi Circular contours (excluding poles on real axis).
- 5. STATISTICS 9**  
 Moments - Coefficient of correlation - Lines of regression - Tests based on Normal and t distributions, for means and difference of means - Chi Square test for goodness of fit.

**Total No of periods: 45**

*Text Books:*

1. Kreyszig, E., " *Advanced Engineering Mathematics* " (8th Edition), John Wiley and Sons, (Asia) Pte Ltd., Singapore, 2000.
2. Grewal, B.S., " *Higher Engineering Mathematics* " (36th Edition), Khanna Publishers, Delhi 2001

*References:*

1. Kandasamy, P., Thilagavathy, K., and Gunavathy, K., " *Engineering Mathematics* ", Volumes I & II (4th Revised Edition), S. Chand & Co., New Delhi, 2001.
2. Narayanan, S., Manicavachagom Pillay, T.K., Ramanaiah, G., " *Advanced Mathematics for Engineering Students* ", Volumes I & II (2nd Edition), S. Viswanathan (Printers & Publishers, Pvt, Ltd.), 1992.
3. Venkataraman, M.K. " *Engineering Mathematics III - A* ", National Publishing Company, Chennai, (13th Edition), 1998.

**1. ELECTROSTATICS AND ELECTROMAGNETISM 9**

Electric field and potential - Gauss theorem - Applications - dielectrics - capacitance - energy stored in a dielectric medium - types of capacitors - Loss of energy due to sharing of charges by the capacitors - electrical conductivity in conductors - Carey Foster's bridge - Maxwell's equations - Free space wave equation - Characteristic impedance.

**2. QUANTUM PHYSICS 9**

Development of quantum theory - Dual nature of matter and radiation - Compton effect - Pair production - Uncertainty principle - Equivalence of mass and energy Schrodinger's wave equation - Particle in a box - Electrons in a metal.

**3. ATOMIC AND NUCLEAR PHYSICS 9**

Characteristics of atomic spectra - molecular spectra - vector atom model - Stern and Gerlach experiment - Raman Effect and its applications - Liquid drop model - Explanation for Nuclear fusion - Shell model - Chain reaction - Criticality - Four factor formula - Q value - Power reactors - Laser induced Nuclear fusion.

**4. ELEMENTARY CRYSTALLOGRAPHY 9**

Crystalline and non-crystalline materials - Bravais lattices - Crystal systems - Symmetry elements - Simple crystal structures - Packing factor for sc, bcc, fcc, hcp structures - Miller Indices - Imperfections in crystals - Bragg's law and x-ray diffraction methods to study crystal structures.

**5. NON DESTRUCTIVE TESTING 9**

Liquid penetrant, Magnetic particle and eddy current methods - X-ray radiography - Fluoroscopy - Gamma ray radiography - Ultrasonic scanning methods - Ultrasonic flaw detector - Thermography.

**6. PRACTICALS 30**

1. Meter Bridge - Temp. Coefficient
2. Field along the axis of coil - Determination of H
3. Carey Foster's Bridge - Resistivity
4. X-ray diffraction - calculation of cell parameters
5. Newton's rings - Wavelength measurement
6. Spectrometer - Dispersive power of a prism
7. Rigidity modulus - static torsion
8. Ammeter & voltmeter calibration using potentiometer

**Total No of periods: 75**

*Text Books:*

1. Arumugam, M., " *Engineering Physics* ", Anuradha Publications, 1998.

*References:*

1. Beiser, A., " *Perspective of Modern Physics* ", John Wiley, 1985
2. Tayal, D.S., " *Nuclear Physics* ", Himalayan Publishers, 1998
3. Vasudeva, D.N., " *Fundamentals of Electricity and Magnetism* ", S.Chand & Co., 1985.
4. Hull, B. and John V., " *Nondestructive Testing* ", McMillan Education Ltd, London, 1988

**1. PRINCIPLES OF GRAPHICS 16**

Two dimensional geometrical construction - Conic sections, involutes and cycloids - Representation of three dimensional objects - Principles of projections - standard codes of principles.

**2. ORTHOGRAPHIC PROJECTIONS 28**

Projections of points, straight line and planes - ' Auxiliary projections ' - Projection and sectioning of solids - Intersection of surfaces - Development of surfaces.

**3. PICTORIAL PROJECTIONS 8**

Isometric projections - ' Perspectives ' - Free hand sketching.

**4. COMPUTER GRAPHICS 8**

Hardware - Display technology - Software - Introduction to drafting software.

**Total No of periods: 60**

*Text Books:*

1. Narayanan, K.L., and Kannaiah, P., " Engineering Graphics ", Tata McGraw-Hill Publishers Co., Ltd., 1992.

*References:*

1. William M. Neumann and Robert F. Sproul, " Principles of Computer Graphics ", McGraw Hill, 1989.
2. Warren J. Luzzadder and John M. Duff, " Fundamentals of Engineering Drawing ", Prentice-Hall of India Private Ltd., Eastern Economy Edition, 1995.
3. Natarajan K.V., " A Text Book of Engineering Drawing ", Private Publication, Madras, 1990.
4. Mathur, M.L. and Vaishwanar, R.S., " Engineering Drawing and Graphics ", Jain Brothers, New Delhi, 1993.

<b>1. MULTIUSER OPERATING SYSTEM</b>	<b>4</b>
Unix: Introduction - Basic Commands - Vi editor - filters - Input/output redirection - piping - transfer of data between devices - shell scripts.	
<b>2. FUNDAMENTALS OF NETWORKING</b>	<b>3</b>
Working on a networked environment - Accessing different machines from one node - concept of E-mail - Uses of Internet.	
<b>3. HIGH LEVEL LANGUAGE PROGRAMMING</b>	<b>8</b>
C Language: Introduction - Operator - Expressions - Variables - Input/output statements - control statements - function arrays - pointer - structures - unions - file handling - case studies.	
<b>4. TUTORIAL</b>	<b>45</b>

**Total No of periods: 60**

*Text Books and References:*

1. *Stephan J. Kochen & Patrick H. Wood, "Exploring the UNIX System", Techmedia, 1999.*
2. *Maurice J. Bach, "The design of UNIX Operating Systems", Prentice Hall of India, 1999.*
3. *Ramos, "Computer Networking Concepts", Prentice Hall International, 1999.*
4. *Balagurusamy, "Programming in ANSI C", Tata McGraw Hill, 1999.*
5. *Kernighan and Ritchie, "The C Programming Language", Prentice Hall of India, 1999.*
6. *Gottfried, "Programming with C", Tata McGraw Hill, 1999.*
7. *Kutti, "C and UNIX Programming: A Conceptual Perspective", Tata McGraw Hill, 1999.*
8. *Eric Nagler, "Learning C++", M/s. Jaico Publishing Co., 1998-99.*

<b>1. CARBOHYDRATES</b>	<b>8</b>
Introduction - Mono and Disaccharides - Important reactions - Polysaccharides - Starch and Cellulose - Derivatives of Cellulose - Carboxy Methyl Cellulose and gun cotton - Structural aspects of cellulose.	
<b>2. ORGANO METALLIC COMPOUNDS</b>	<b>5</b>
Grignard reagents and their synthetic utility - Organo Silicon compounds.	
<b>3. OILS, FATS AND WAXES</b>	<b>5</b>
Analysis of oils and fats - classification of waxes	
<b>4. HETEROCYCLIC COMPOUNDS</b>	<b>8</b>
Furan, Thiophene, Pyrrole, Pyridine, and Indole - Their important derivatives	
<b>5. DYES AND DYEING</b>	<b>7</b>
Colour and Constitution	
- Synthesis of some important azodyes (Methyl orange, Methyl red and Congo red)	
- Synthesis of Triphenylmethane dyes (Malachite green, Para Rosaniline Anthraquinone dyes (Alizarin).	
- Phthalein dyes - Eosin preparation	
- Introduction to Natural and Reactive dyes	
<b>6. AMINO ACIDS AND PROTEINS</b>	<b>5</b>
Classification of proteins - Tests for proteins - Denaturation - Structural aspects of wool.	
<b>7. PHARMACEUTICAL CHEMISTRY</b>	<b>7</b>
Synthesis of antimalarial drugs - Isopentaquine and chloroquine - Antibacterial drugs - Synthesis of sulphanilamide, sulphapyridine.	

**Total No of periods: 45**

*References:*

1. *Agarwal, O.P., " Synthetic Organic Chemistry ", Vth Edition, 1980-81, Goel Publishing House, Meerut.*
2. *Ashutoshkar, " Medicinal Organic Chemistry ", New Age International Private Ltd., 1993, Chennai.*
3. *Bahl, B.S. and Arun Bahl, " Advanced Organic Chemistry ", IIIrd Edition(1994), Sultan Chand and sons, New Delhi.*
4. *Mrs. Lakshmi, S., " Pharmaceutical Chemistry ", First Edition (1995), Sultan Chand and Sons, New Delhi.*
5. *Morrison, R.T. and Boyd, R.N., " Organic Chemistry ", VI Edition, Prentice Hall Inc.(1996), USA.*
6. *Tiwari, K.S., Vishnoi, N.K. and Vishnoi, S.N., " A Text book of Organic Chemistry ", Second Edition, Vikas Publishing House (1998), New Delhi.*

- 1. ELECTROCHEMISTRY 11**  
Electrical Conductance - Specific conductance - Equivalent conductance - Variation with dilution - Kohlrausch's law - Transport Number - Galvanic cells - EMF and its measurement - Reference electrode - Standard Hydrogen Electrode - Nernst equation - Electrochemical series - Applications of EMF measurements.
- 2. CHEMICAL KINETICS 6**  
Kinetics of parallel and opposing reactions - Concept of activation energy - Arrhenius equation - Theory of absolute reaction rates - Kinetics of Enzyme catalysed reactions.
- 3. PHASE RULE 6**  
Definition - Derivation - Application of phase rule to water system - Thermal Analysis - Cooling curves - Two Component system - Eutectic and compound formation.
- 4. ADSORPTION AND CATALYSIS 8**  
Physical and Chemical adsorption - Types of adsorption isotherm, BET method, Gibbs equation, Homogeneous catalysis - Heterogeneous catalysis, Acid - base catalysis, Enzyme catalysis - Applications of catalysts in industries.
- 5. COLLOIDS 7**  
Introduction to colloids - Properties of colloids - Electrokinetic phenomena - Donnan Membrane equilibrium - Emulsions - Gels - Colloidal electrolytes.
- 6. PHOTOCHEMISTRY 7**  
Laws of Photochemistry, Quantum efficiency, Photochemical reactions, Actinometry, Kinetics and mechanism of hydrogen - bromine reaction.

**Total No of periods: 45**

*References:*

1. *Puri B.H. and Sharma L.R., " Principles of Physical Chemistry ", S.Nagin Chand and Company, Delhi (1994).*
2. *Kund and Jain, " Physical Chemistry ", S. Chand and Company, Delhi (1996).*
3. *Gordon M.Barrow, " Physical Chemistry ", Sixth Edition, Tata McGraw Hill (1998).*

**1.**

Definition and classification of textile fibres. Desirable properties of ideal textile fibres - staple fibre, filament; types of yarn-spun, continuous filament; monofilament, multi filament, flat and textured yarn -single, ply and cable yarns. The three important methods of spinning man-made fibres - melt, dry and wet spinning techniques and the importance of stretching process in the manufacture of man-made fibres. Definition and classification of textile fibres.

**2.**

**NATURAL CELLULOSIC FIBRES:** Cotton cultivation and have testing. Classification of world cottons with details of their length, fineness, colour and spin ability. Chemical composition of raw cotton, physical and chemical properties of cotton. Cultivation and harvesting of jute; Flax extraction of the fibre from plant; uses of jute. Importance of jute to Indian economy. Physical and chemical properties of jute.

**3.**

**PROTEIN FIBRES:** Different types of silk, wild, cultivated; sericulture - life cycle of silk worm; method of extraction of silk from cocoon and the process for the preparation of filature silk and charka silk reeling throwing and doubling, difference between raw, degummed and weighted silk - Degumming and weighing processes; outline of process for manufacture of spun silk and characteristics of spun silk; physical and chemical properties of silk. Study of bivoltine and multivoltine types of silk. Uses of silk. Different types and grades of wool; classification of fleeces; physical and chemical structure of wool; chemical composition of raw wool and production of clean wool form raw wool. Physical and chemical properties of wool. Uses of wool:

**4.**

**REGENERATED CELLULOSIC FIBRES:** Viscose rayon and other HT Rayon. Chemical structure, process sequence in the manufacture of viscose; physical and chemical properties of viscose rayon fibre. Uses of viscose rayon. Polynosic rayon; (High wet modulus or modal fibre). Comparison of chief characteristics of viscose with polynosic rayon's.

**5.**

**SYNTHETIC FIBRES:** Nylon 6: Production and properties of Nylon, polyester, Acrylic, Polypropylene.

**Total No of periods:**

*Reference Books:*

1. *Trotman.E.R Dyeing and Chemical Technology of Textile Fibres 6th Edition 1984, Edward Arnold, Kent, England.*
2. *Gohl.E.P.C and Vilensky.L.D Textile Science, 1st Indian Edition, 1987, CBS Publishers & Distributors Delhi, India.*
3. *Moncrieff.P.W, Man-Made fibres 6th edition, 1988, Newness - Butterworths, London.*
4. *V.A. Shenai.V.A Textile Fibres, 2nd Revised Edition, 1995, Technology of Textile Processing: Sevak Publications, Bombay.*

**1.**

Raw materials and coal tar distillation. Aromatic hydrocarbons from petroleum. Tests and standards of purity.

**2.**

Classification of dyes and intermediates, viz, azines, oxazines, thiazines, xanthine, acridine, thazole, eqinoline, cyanide dyes. Diphenyl and triphenyl methane dyes.

**3.**

Unit processes in organic synthesis such as hlogenation, nitration, Sulphonation, production esterification, hydroxylation, and diazotisation with suitable examples

**4.**

Systematic study of important intermediates from benzene, chlorobenzene, nitrobenzene, aniline, phenol, salicylic acid.

**5.**

Anthraquinone vat dyes, indigoid and thioindigoid dyes, solubilised vat dyes, sulphur colour, phthalocyanines, reactive dyes, disperse dyes. Fluorescent brightening agents - their chemistry and preparation. Action of light on dyed materials. Colour and chemical constitution.

**Total No of periods:**

*REFERENCE BOOKS:*

1. Venkatraman.K., "*The Chemistry of Synthetic Dyes*" - Vol. I & II, Academic press, London, 1971.
2. Shenai.V.A and Saraf.N.M "*Synthetic Organic Textile Chemicals Vol. III*". Sevak Publications, Mumbai.1995.
3. Shore,J. (Ed)., "*Colorants and auxiliaries, Volume 1:Colorants*", SDC, Blackwells, Leeds, 1990, ISBN 0901956511.
4. Shore,J. (Ed)., "*Colorants and auxiliaries, Volume 2: Auxiliaries*", SDC, Blackwells, Leeds, 1990, ISBN 090195651X.
5. Shenai,.V.A., "*Introduction to the Chemistry of Dyestuffs*", Sevak Publications, Mumbai 1995.

**1.**

Introduction - atomic structures - molecular orbital theory - valence bond theory - coordination chemistry - Werner coordination theory - ligands - coordination number - simple and poly nuclear complexes - applications - common ion effect - solubility product - principles with reference to qualitative and quantitative analysis - pH concept - buffer solution - mechanism of buffer action - indicators acid base indicator- selection of indicators and their limitations.

**2.**

Industrial inorganic compounds - manufacture, properties and applications - hydrogen peroxide - sodium carbonate - ammonia - hydrazine - hydroxylamine - chlorine - bleaching powder - sodium hypochlorite - sodium sulphite - sodium bisulphate - sodium phosphate - sodium hydroxide - calcium hydroxide - sodium borate - cyanamide.

**3.**

Industrial gases - natural gas - water gas - producer gas - synthesis gas - hydrogen - oxygen - nitrogen - ozone and sulphur dioxide - (applications only) zeolite - natural and synthetic - nomenclature - applications -water treatment - catalysis - detergency - gas adsorption.

**4.**

Industrial pigments; lithophone - titanium oxide - zinc oxide - barium sulphate - carbon black - activated carbon - ferric oxide - red lead - lead chromate - chrome yellow - zinc yellow - chrome oxide green - prussian blue - printing inks. Industrial fibrous materials - asbestos - glass, boron - aluminum oxide - silicon carbide - whiskers (properties and applications only).

**5.**

Corrosion and its control corrosion - chemical and electrochemical - control methods - surface treatment and protective coatings - wall coatings - primers -commercial paints - failure of paint coatings. Protective coatings - introduction - metallic coatings hot dipping - spraying, cladding and cementation - Inorganic non-metallic coatings - chrome coating - phosphate coatings - chemical oxide coating. Anodized coating - vitreous or porcelain enamel coating.

**Total No of periods:**

*REFERENCES;*

1. Sharpe, A.G., "Inorganic Chemistry", Longman, London (1986).
2. Buchner, W., Schliebs, R., Winter, W., and Buchel, K.H. "Industrial inorganic chemistry", VCH Publishers, New York, (1989).
3. Jastrebski, Z.D., "The natural properties of engineering materials", John Wiley and Sons, New York (1987).
4. Austin, G.T., "Shreve's chemical process industries", McGraw Hill, New York (1984).

**1.**

Fine structure of cotton, wool, silk, polyester, nylon and acrylic. Important physical properties of fibres. Changes brought about by Texturising. Influence of fibre structure, drawing and heat setting on dyeing behavior. Interaction between dye molecules and polymeric chains in the fibres, Description of monolayer technique and continuous variable method for the identification of dye-fibre bonds. Substantivity and Affinity. Thermodynamic derivations of affinity equations. Kinetic of dyeing. Factors affecting the kinetics of dyeing. Thermodynamic derivations of various absorption isotherms. Electrical effects in dyeing equilibrium.

**2.**

Glass transition temperature and its effect on dye ability and dye diffusion temp. Diffusion of Dye. Fick's first and Second laws of diffusion. Equilibrium absorption, diffusion co-efficient and time of half dyeing. Derivation of William Landed Ferry (WLF) equation and its significance. Concept of the free volume and solubility parameter, theory of dyeing. Various proposed theories of carrier dyeing. Idea about partition co-efficient.

**3.**

Relations between Light, Dye, Eye and Brain. Theories of Colour Vision, Hue, Luminosity, Lightness, Saturation, Whiteness Index, Yellowness Index, Reducing Power, Opacity, Assessment of dispersion, degree of flocculation, scattering co-efficient and contrast ratio. Beer - Lambert's Law, Colour Primaries and Colour mixing - Colour mixing. Colour illusion. Colour specification. Munsel colour order system and Ostwald Colour system. Principles of Colour measurements. Tri stimulus values. C.I.E. diagram. Standard illuminant, Standard Observer, Spectral Reflectance. Graphic representation, Numeric representation, and Colour space (CIE LAB AND HUNTER LAB) chromaticity co-ordinates.

**4.**

CIE definition of metamerism, Observer metamerism, illuminant metamerism, Geometric metamerism, instrumental metamerism, Dichorism and Non-metameric matches. Visual Photo Electric and Spectrophotometric colorimeter. Variables affecting Visual and Instrumental estimates of colour difference.

**5.**

Advantages of C.C.M. Application of C.C.M. to Textile processing, Spectral Match and Tristimulus Match. Technique of C.C.M. for Textiles. Single Constant (K/S) K-M theory. C.C.M. techniques for blended fibres / fabrics. Sample preparation in C.C.M., Limitation of C.C.M. technique.

**Total No of periods:**

*REFERENCE BOOKS:*

1. *Peters.A.T and Freeman,H.S 'Physico - chemical Principles of colour chemistry', Blackie, 1995, ISBN :0751402109.*
2. *Johnson,A, 'The theory of colouration of textiles', SDC 2nd Edition, 1989, ISBN 0901956481.*
3. *Peters.A.T and Freeman,H.S 'Analytical chemistry of synthetic colorants', Blackie, 1994, ISBN 0751402087.*

**1. BASIC CONCEPTS OF POLYMER SCIENCE 4**

Monomer - Functionality - Degree of polymerisation, Polymer classification based on source and applications. Raw materials - Source and their derivatives.

**2. SYNTHESIS OF POLYMERS 6**

Mechanism of polymerisation - Addition, condensation. Methods of polymerisation - Bulk, solution, emulsion and suspension.

**3. CHARACTERISATION OF POLYMERS 12**

Average molecular weight. Property of polymers - Structure of polymers - Effect of molecular structure on properties - Crystallinity - Orientation - Glass transition temperature and melting behaviour and solubility of polymers. Mechanical, optical, thermal, electrical, chemical and weather resistant characteristics.

**4. POLYMERIC MATERIALS 15**

Polyethylene, polypropylene, polystyrene, polycarbonate, polyvinyl chloride, polyacrylonitrile, polyurethanes, polyester, polyamide, graphite and carbon fibre.

**5. PROCESSING ADDITIVES AND METHODS 8**

Nucleating agents, UV stabilisers, anti-microbials, antistatics, blowing agents, coupling agents, flame retardants, heat stabilizers, release agents, viscosity control additives. Extrusion - Film extrusion - Extrusion coating - powder coating - Spinning method.

**Total No of periods: 45**

*References:*

1. Seymour, R.B., " *Applications of polymers* ", Plenum publishing corporation, New York, 1988.
2. Seymour, R.B., " *Engineering Polymer Source Book* ", McGraw Hill Publishing Co., New York, 1990.
3. Schwartz S.S. and Goodman S.H., " *Plastics Materials and Processes* ", Von Nostrand Reinhold Company, New York, 1982.
4. Brydon J.A., " *Plastics Materials* ", Academic Press, New York, 1982.

**1. PROBABILITY AND RANDOM VARIABLES 7**

Probability concepts, Random variables, Moments, Moment Generating function, Binomial Posson, Geometric, Negative binomial, Exponential Gamma, Weibull distributions, Functions of random variable, Chebycnev inequality.

**2. TWO -DIMENSIONAL RANDOM VARIABLES 10**

Marginal and conditional distributions, Covariance, Correlation and regression, Transformation of random variables, Central limit theorem.

**3. DESIGN OF EXPERIMENTS AND QUALITY CONTROL 10**

Completely randomized design, Randomized block design Latin square design, Process control, Control chairs of measurements and attributes, Tolerance limits.

**4. LINEAR PROGRAMMING 10**

Formulation of linear programming problem graphical solution simplex algorithm artificial variable and the M-method, degeneracy, alternative optima and unbounded solution.

**5. FURTHER TOPICS IN LINEAR PROGRAMMING 8**

Duality, primal-dual computations, transportation model and algorithm, Assignment model and Hungarian technique of solution, imbalance, cost Maximization alternative optima in transportation and assignment method.

**6. TUTORIAL 15**

**Total No of periods: 60**

*References:*

1. *Miller and Freund, J.E., " Probability and Statistics for Engineers ", Prentice Hall of India, New Delhi, 1977.*
2. *Kapur, J.N. and Saxena, H.C., " Mathematical statistics ", S.Chand & Company Ltd.,*
3. *Taha, H.A., " Operations Research, An Introduction ", Macmillan , New York, 1976.*
4. *Kanti Swarup, Guptha.P.K. and Man Mohan, " Operations Research ", Sultan Chand and Sons, New Delhi, 1982.*

**1. UNIT I 12**

Classification of Unit Operations

Heat transfer-Modes of HT, Fourier's law of heat conduction, steady state conduction across composite walls, cylinder and hollow sphere. Insulated bodies. Film concept and convective heat transfer coefficient. Convection - Heat transfer by natural & forced convection. Heat transfer in laminar & turbulent flow, Counter current, parallel and cross flows. Individual and overall heat transfer coefficients. LMTD

**2. UNIT II 12**

Heat exchange equipments - double pipe and shell and tube heat exchangers, condensers (Equipment description & solution to simple problems)

Mass Transfer - Principles of diffusion, theory of diffusion, Mass transfer coefficients and film theory Penetration theory.

Distillation - Vapour liquid equilibria, Simple distillation, Steam distillation, Continuous binary distillation. Industrial equipments for distillation.

**3. UNIT III 12**

Agitation of liquids - Types of impellers. Selection criteria. Power consumption calculations for agitated vessels.

Absorption - Principle and equipment (packed towers and plate columns).

Adsorption - Principle and equipment for adsorption.

**4. UNIT IV 12**

Drying - Principles and definitions. Rate of batch drying. Equipments for drying.

Humidification - Humidity and saturation, dry bulb and wet bulb temperatures, percentage saturation, dew point, humid volume, humid heat, enthalpy. Equipment - Water - cooling towers, spray chambers.

**5. UNIT V 12**

Membrane Separation Processes - Separation of gases and liquids, Dialysis, Membrane liquid-liquid extraction, pervaporation and reverse osmosis.

Size reduction Laws of crushing, Equipment-classification, Crushers and grinders.

Mechanical separations-Screening and screening equipments, Filtration- principle and filtration equipment (filter press, shell and leaf filter, rotary drum filter, centrifugal filter, centrifuges), filter media, filter aids. Gravity settlers. Cyclones and hydro cyclones.

(Basic principles and equipment description only. Mathematical consideration not required for Size Reduction & Mechanical Separation)

**Total No of periods: 60**

*References: BOOKS:*

1. *W.L. McCabe, J.C. Smith, Unit Operations of Chemical Engineering -., Mc. Graw Hill, 1993.*
2. *W.L. Badger, J.T. Banchero. Introduction to Chemical Engineering, Mc. Graw Hill, UK, 1997.*
3. *Richardson and Coulson, Chemical Engineering. Vol. 1 & Vol. 2, Asian Books Pvt. Ltd., India, 1996.*
4. *Chemical Engineer's handbook - Perry and Chilton.*
5. *Principles of Unit Operations - Foust A.S., Walzel.L.A. , John Wiley.*

**1. STRUCTURE OF FIBRES** 4

Structure of textile natural and man-made fibres physical, Chemical and morphology.

**2. INVESTIGATION OF FIBRE STRUCTURE** 4

Electron microscopy-Sample preparation techniques, X-ray diffraction methods, Infra-red radiation techniques.

**3. MOISTURE ABSORPTION STUDY IN FIBRES** 8

Hygroscopic nature of fibres-Effect of fibre structure and climate conditions. Heat of sorption-types -relation to fibre structure. Conditioning of fibres-mechanism-factors influencing conditioning.

**4. MECHANICAL PROPERTIES OF FIBRES** 12

Tensile characteristics-stress-strain relation-influence of humidity and temperature on tensile characteristics. Elastic properties-Recovery-Elastic recovery and its relation to stress and strain; Mechanical conditioning-advantages-creep phenomena. Torsional Rigidity-its relation to other fibre properties-measurement techniques. Flexural Rigidity-its relation to other fibre properties-Measurement techniques.

**5. OPTICAL AND FRICTIONAL PROPERTIES** 7

Lustre Index-Refractive index-Birefringence-Factors influencing Birefringence-Refractive Index measuring techniques-polarised light method-wave length method. Role of friction in fibre processing-measurement of friction.

**6. ELECTRICAL AND THERMAL PROPERTIES** 10

Electrical resistance of fibres-Measurement -Di electricity-Factors influencing di-electricity. static electricity-problems-elimination techniques. Flammability of fibres-thermal conductivity-Heat setting.

**Total No of periods: 45**

*Text Books:*

1. Meredith. R and Hearle, J.W.S., " *Physical methods of investigation of Textiles* ", Wiley Publication, NY, 1989.
2. Morton W.E and Hearle, J.W.S., " *Physical Properties of Textile Fibres* ", The Textile Institute, England, 1993.

*References:*

1. Meredith R. " *Mechanical properties of Textile Fibres* ", North Holland, Amsterdam 1986.
2. Milton Harris, M. " *Hand Book of Textile Fibres* ", Haris Research Lab. Inc., Washington, 1984.
3. Hearle, J.W.S., " *Polymers and their properties* ", Vol. 1, *Fundamentals of Structure and Mechanics*, Ellis Horwood, England, 1982.
4. Carty, P " *Fibre Properties* ", From word, U.K. 2nd Ed.1994.
5. Greaves P.H. and Aville B.P., " *Microscopy of Textile Fibres* ", Bios Scientific U.K., 1995
6. Saville, " *Physical Testing of Textiles* ", M.K.Book Distributors, 1998.