ANNA UNIVERSITY : : CHENNAI 600 025

UNIVERSITY DEPARTMENTS

R – 2008

B.TECH. TEXTILE TECHNOLOGY

III TO VIII SEMESTERS CURRICULUM AND SYLLABI

SEMESTER III

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
MA 9211	Mathematics III	3	1	0	4
CY 9211	Organic Chemistry	3	0	0	3
CY 9213	Instrumental Methods of Analysis	3	0	0	3
CE 9215	Mechanics of Solids	3	0	0	3
EE 9213	Electrical Drives and Controls	3	0	0	3
TT 9201	Physical Structure and Properties of Fibres	3	0	0	3
PRACTICAL					
EE 9214	Electrical Eng. Lab	0	0	3	2
CY 9214	Instrumental Methods of Analysis Lab	0	0	4	2
	TOTAL	**18**	**1**	**7**	**23**

SEMESTER IV

CODE NO	COURSE TITLE	L	T	P	C
THEORY					
MA 9261	Probability and Statistics	3	1	0	4
CY 9261	Physical Chemistry	3	0	0	3
CH 9204	Basic Mechanical Engineering	3	0	0	3
TT 9251	Spun Yarn Technology 1	4	0	0	4
TT 9252	Technology of Fabric Manufacture I	4	0	0	4
TT 9253	Fabric Structure	3	0	0	3
PRACTICAL					
CH 9257	Mechanical Eng. Lab	0	0	4	2
TT 9254	Fibre Science Lab	0	0	3	2
	TOTAL	**20**	**1**	**7**	**25**

SEMESTER V

CODE No.	COURSE TITLE	L	T	P	C
Theory					
TT 9301	High Performance Fibres	3	0	0	3
TT 9302	Spun Yarn Technology II	3	0	0	3
TT 9303	Technology of Fabric Manufacture II	3	0	0	3
TT 9304	Chemical Processing of Textiles and Apparels I	3	0	0	3
TT 9305	Knitting Technology	4	0	0	4
	Elective I	3	0	0	3
Practical					
TT 9306	Technical Seminar	0	0	2	1
TT 9307	Yarn Manufacture Laboratory	0	0	3	2
TT 9308	Cloth Analysis Laboratory	0	0	3	2
	TOTAL	**19**	**0**	**8**	**24**

SEMESTER VI

CODE NO.	COURSE TITLE	L	T	P	C
THEORY					
TT 9351	Chemical Processing of Textiles and Apparels II	3	0	0	3
TT 9352	Quality Assessment of Textile Products	3	0	0	3
TT 9353	Technical Textiles	3	0	0	3
TT 9354	Bonded fabrics	3	0	0	3
TT 9355	Financial Management for Textile and Apparel Industries	3	0	0	3
	Elective II	3	0	0	3
PRACTICAL					
TT 9356	Fabric Manufacture laboratory	0	0	3	2
TT 9357	Technical Textiles Laboratory	0	0	2	1
TT 9358	Textile Quality Evaluation Laboratory	0	0	3	2
GE 9371	Communication Skills and Soft Skills Laboratory	0	0	2	1
	TOTAL	**18**	**0**	**10**	**24**

SEMESTER VII

CODE No.	COURSE TITLE	L	T	P	C
Theory					
TT 9401	Total Quality Management for Textile and Apparel Industries	3	0	0	3
GE 9261	Environmental Science and Engineering	3	0	0	3
TT 9402	Garment Technology	4	0	0	4
TT 9403	Mechanics of Textile Machinery	3	0	0	3
TT 9404	Clothing Science	3	0	0	3
	Elective III	3	0	0	3
	Elective IV	3	0	0	3
PRACTICAL					
TT 9407	Textile Chemical Processing Laboratory	0	0	3	2
TT 9408	Industrial Training*	0	0	0	1
	TOTAL	**22**	**0**	**3**	**25**

* Students should undergo industrial training for **Four weeks training, two each** at the end of 4th and 6th Semester.

SEMESTER VIII

CODE No.	COURSE TITLE	L	T	P	C
THEORY					
	Elective V	3	0	0	3
	Elective VI	3	0	0	3
PRACTICAL					
TT 9451	Project Work	0	0	12	6
	TOTAL	**6**	**0**	**12**	**12**

TOTAL CREDITS 188

LIST OF ELECTIVES FOR B. TECH. TEXTILE TECHNOLOGY

CODE No.	COURSE TITLE	L	T	P	C
GE 9023	Fundamental of Nano Science	3	0	0	3
TT 9021	Fibre and Textile Composites	3	0	0	3
TT 9022	Textured Yarn Technology	3	0	0	3
TT 9023	Silk Yarn Technology	3	0	0	3
TT 9024	New Spinning Technologies	3	0	0	3
TT 9025	Theory of Yarn Spinning	3	0	0	3
TT 9026	Long Staple Fibre Spinning Technology	3	0	0	3
TT 9027	Process Control in Man-made Fibre Yarn Production	3	0	0	3
TT 9028	Mechanics of Textile Structures	3	0	0	3
TT 9029	Warp Knitting Technology	3	0	0	3
TT 9030	Advances in Spun bonded and Melt Blown Technology	3	0	0	3
TT 9031	Colour Science, Measurement and its Applications	3	0	0	3
TT 9032	Fabric and Garment Finishing	3	0	0	3
TT 9033	Synthetic Fibre Colouration	3	0	0	3
TT 9034	Process Control in Textile Chemical Processing	3	0	0	3
TT 9035	CAD and CAM for Textiles and Apparels	3	0	0	3
TT 9036	Quality Assurance in Garment Industry	3	0	0	3
TT 9037	Protective Garments	3	0	0	3
TT 9038	Industrial Engineering for Textile and Apparel Industries	3	0	0	3
TT 9039	Energy Management in Textile Industry	3	0	0	3
TT 9040	Textile Mill Planning and Management	3	0	0	3
TT 9041	Operations Research	3	0	0	3
TT 9042	Production and Operations Management	3	0	0	3
TT 9043	Personnel Management in Apparel Industry	3	0	0	3
TT 9044	Textile Product Engineering	3	0	0	3
TT 9045	Computer Programming for Textile Technologists	3	0	0	3
TT9046	Industrial Management for Textile and Apparel Industries	3	0	0	3
GE 9021	Professional Ethics in Engineering	3	0	0	3

MA9211 **MATHEMATICS III** **L T P C**
(common to all branches of B.E. / B.Tech programmes) **3 1 0 4**

AIM

To facilitate the understanding of the principles and to cultivate the art of formulating physical problems in the language of mathematics.

OBJECTIVES

- To introduce Fourier series analysis which is central to many applications in engineering apart from its use in solving boundary value problems
- To acquaint the student with Fourier transform techniques used in wide variety of situations in which the functions used are not periodic
- To introduce the effective mathematical tools for the solutions of partial differential equations that model physical processes
- To develop Z- transform techniques which will perform the same task for discrete time systems as Laplace Transform, a valuable aid in analysis of continuous time systems

UNIT I FOURIER SERIES 9+3

Dirichlet's conditions – General Fourier series – Odd and even functions – Half-range Sine and Cosine series – Complex form of Fourier series – Parseval's identity – Harmonic Analysis.

UNIT II FOURIER TRANSFORM 9+3

Fourier integral theorem – Fourier transform pair-Sine and Cosine transforms – Properties – Transform of elementary functions – Convolution theorem – Parseval's identity.

UNIT III PARTIAL DIFFERENTIAL EQUATIONS 9+3

Formation – Solutions of first order equations – Standard types and Equations reducible to standard types – Singular solutions – Lagrange's Linear equation – Integral surface passing through a given curve – Solution of linear equations of higher order with constant coefficients.

UNIT IV APPLICATIONS OF PARTIAL DIFFERENTIAL EQUATIONS 9+3

Method of separation of Variables – Solutions of one dimensional wave equation and one-dimensional heat equation – Steady state solution of two-dimensional heat equation – Fourier series solutions in Cartesian coordinates.

UNIT V Z – TRANSFORM AND DIFFERENCE EQUATIONS 9+3

Z-transform – Elementary properties – Inverse Z-transform – Convolution theorem – Initial and Final value theorems – Formation of difference equation – Solution of difference equation using Z-transform.

L: 45, T: 15, TOTAL : 60 PERIODS

TEXT BOOKS

1. Grewal, B.S. "Higher Engineering Mathematics", Khanna Publications (2007)

REFERENCES

1. Glyn James, "Advanced Modern Engineering Mathematics, Pearson Education (2007)
2. Ramana, B.V. "Higher Engineering Mathematics" Tata McGraw Hill (2007).
3. Bali, N.P. and Manish Goyal, "A Text Book of Engineering 7th Edition (2007) Lakshmi Publications (P) Limited, New Delhi.

CY9211 **ORGANIC CHEMISTRY** **L T P C**

(Common to Chemical, Textile, Leather, Petroleum Refining & Petrochemicals and Apparel Technology) **3 0 0 3**

AIM

To learn fundamental and applied aspects of organic chemistry towards different applications.

OBJECTIVES

- To acquire knowledge about chemical bonding, hybridization, bond fission, different types of chemical reactions and their mechanism, isomerism in organic molecules, synthesis of organic compounds and various applications of organic products.

UNIT I STRUCTURAL CONCEPT OF ORGANIC MOLECULES 5

Nature of bonding (covalent, hydrogen) – atomic orbitals – hybridization – electronegativity – conjugation – mesomerism and resonance – hyper-conjugation – inductive effect.

UNIT II REACTION AND THEIR MECHANISM 10

Homolytic bond fission – free radicals – heterolytic bond fission – electrophiles, carbonium ion, nucleophiles – acids and bases – Bronsted - Lowry concept, Lewis concept, strength of acids and bases. Substitution reactions – S_N1, S_N2, S_Ni, Addition reactions – carbon – carbon (double bond), Addition of dienes – carbon – oxygen (double bond), carbon – carbon (triple bond) – poly addition reactions, Elimination reactions – E1, E2, Condensation – simple and polycondensation, Redox reactions.

UNIT III ISOMERISM 6

Structural isomerism – stereoisomerism – optical isomerism – racemic mixture – resolution, racemisation – asymmetric synthesis, Walder Inversion.

Geometrical isomerism – cis, trans isomerism, syn, anti isomerism – determination of configuration of geometrical isomers – tautomerism.

UNIT IV HYDROCARBONS AND THEIR CLASSIFICATION 10

Alkanes – alkenes – alkynes – alicylic compounds – Bayers-strain theory - Hydrocarbons related to petrol, diesel, kerosene, lube oil and waxes. Benzene and its homologues – aromatic substitution, Friedal - Crafts reactions, Kolbe's synthesis – Riemer – Tiemann reaction, Benzoin condensation, Perkin reaction, Beckmann rearrangement, Claison condensation, Hoffmann rearrangements.

UNIT V SYNTHETIC ORGANIC CHEMISTRY 7

Synthesis of different types of compounds – alcohol – aldehyde – carboxylic acid – ester – ether – nitrocompounds – amines – amides (industrial methods only). Synthetic reagents – acetoacetic ester – malonic ester and Grignard reagent.

APPLIED ORGANIC CHEMISTRY **7**

Polysaccharides – starch and cellulose – Proteins – amino acids and peptides – Dyes and dyeing – colour and constitution – classification of dyes based on chemical constitution and applications.

TOTAL : 45 PERIODS

TEXT BOOKS

1. B.S. Bahl and Arun Bahl, "Essentials of Organic Chemistry", S.Chand and Company, New Delhi (2005).
2. K.S. Tiwari, N.K. Vishnoi and S.N. Malhotra "A Text Book of Organic Chemistry", Third Edition, Vikas Publishing House Pvt. Ltd., New Delhi (2006).

REFERENCES

1. R.T. Morrison and R.N. Boyd "Organic Chemistry" VI Edition, Prentice Hall of India Pvt. Ltd., New Delhi (2000).
2. I L Finar "Organic Chemistry", Volume – I, IX Edition, Pearson Education (Singapore) Pte. Ltd., New Delhi (2004).
3. I L Finar "Organic Chemistry", Volume – II, VII Edition, Pearson Education (Singapore) Pte. Ltd., New Delhi (2004).

CY9213 **INSTRUMENTAL METHODS OF ANALYSIS** **L T P C**

(Common to Chemical, Textile, Leather, Ceramic and Petroleum Refining & Petrochemicals) **3 0 0 3**

AIM

To know the principle and importance of various analytical instruments used for the characterization of various materials

OBJECTIVES

- To have thorough understanding of theory, instrumentation and applications of analytical equipments used in industries for testing quality of raw materials, intermediates and finished products
- To know the importance of analytical instrumentation during the purification, compounding and formulating the finished product

UNIT I INTRODUCTION TO SPECTROSCOPICAL METHODS OF ANALYSIS 12

ELECTROMAGNETIC RADIATION: Various ranges, Dual properties, Various energy levels, Interaction of photons with matter, absorbance & transmittance and their relationship, Permitted energy levels for the electrons of an atom and simple molecules, Classification of instrumental methods based on physical properties

QUANTITATIVE SPECTROSCOPY: Beer -Lambert's law, Limitations, Deviations (Real, Chemical, Instrumental), Estimation of inorganic ions such as Fe, Ni and estimation of Nitrite using Beer -Lambert's Law

UNIT II UV AND VISIBLE SPECTROCOPY 12

Various electronic transitions in organic and inorganic compounds effected by UV, and Visible radiations, Various energy level diagrams of saturated, unsaturated and carbonyl compounds, excitation by UV and Visible radiations, Choice of solvents, cut off wavelengths for solvents, Lamda max and epsilon max rules, Woodward -Fieser rules for the calculation of absorption maxima (Lamda max) for dienes and carbonyl compounds, Effects of auxochromes and efffects of conjugation on the absorption maxima, Different shifts of absorption peaks(Batho chromic, hypsochromic, hypochromic), Multicomponent analysis (no overlap, single way overlap and two way overlap), Instrumentation for UV and VISIBLE spectrophotometers (source, optical parts and detectors), Photometric titration (Experimental set -up and various types of titrations and their corresponding curves), Applications of UV and VISIBLE spectroscopies

UNIT III IR , RAMAN AND ATOMIC SPECTROSCOPY 10

Theory of IR spectroscopy, Various stretching and vibration modes for diatomic and triatomic molecules (both linear and nonlinear), various ranges of IR (Near, Mid, Finger print and Far) and their usefulness, Instrumentation (Only the sources and detectors used in different regions), sample preparation techniques, Applications.Raman spectroscopy: Theory, Differences between IR and Raman. Atomic absorption spectrophotometry: Principle, Instrumentation (Types of burners, Types of fuels, Hollow cathode lamp, Chopper only) and Applications, Various interferences observed in AAS (Chemical, radiation and excitation) Flame photometry: Principle, Instrumentation, quantitative analysis (Standard addition method and internal standard method) and applications

Differences between AAS and FES.

UNIT IV THERMAL METHODS 5

Thermogravimetry: Theory and Instrumentation, factors affecting the shapes of thermograms (Sample Characteristics and instrumental characteristics), thermograms of some important compounds (CuSO4. $5H_2O$, CaC_2O_4. $2H_2O$, MgC2O4, Ag_2CrO_4, Hg_2CrO_4, $AgNO_3$ etc), applications. Differential thermal analysis: Principle, Instrumentation and applications, differences between DSC and DTA. Applications of DSC (Inorganic and Polymer samples)

UNIT V CHROMATOGRAPHIC METHODS 6

Classification of chromatographic methods, Column, Thin layer, Paper, Gas, High Performance Liquid Chromatographical methods (Principle, mode of separation and Technique). Separation of organic compounds by column and Thin layer, mixure of Cu, Co and Ni by Paper, separation of amino acids by paper, estimation of organic compounds by GC and HPLC

TOTAL : **45 PERIODS**

REFERENCES

1. Willard, H.H., Merritt.l.l., Dean J.a., and Settle,F.A., Instrumental methods of analysis, Sixth edition, CBS publishers,1986
2. Skoog D.A and West D.M, Fundamentals of Analytical Chemistry, Saunders -college Publishing, 1982.
3. Banwell, G.C., Fundamentals of molecular spectroscopy, TMH,1992.
4. A.I. Vogel's Quantitative Inorganic analysis . V Edition
5. Day R.A Underwood A.L Qualitative Inorganic analysis (A. I. Vogel).
6. V Edition, Prentice-Hall of India (P) Ltd, NewDelhi
7. Sharma, B.K., Instrumental Methods of Analysis, Goel publishing House,1995
8. Kalsi .P.S. Spectroscopy of organic compounds, 6th Edition, New Age International Publishers,2006
9. William Kemp, Organic Spectroscopy, 3rd Edition, Palgrave publishers, 2007
10. Sathya Narayana. D. N. Vibrational Spectroscopy, First Edition 2004 and Reprint 2005, New Age International publishers.

CE9215 MECHANICS OF SOLIDS L T P C
3 0 0 3

AIM

To given them knowledge on structural, Mechanical properties of Beams, columns.

OBJECTIVES

- The students will be able to design the support column, beams, pipelines, storage tanks and reaction columns and tanks after undergoing this course. This is precursor for the study on process equipment design and drawing.

UNIT I STRESS, STRAIN AND DEFORMATION OF SOLIDS 9

Rigid bodies and deformable solids – forces on solids and supports – equilibrium and stability – strength and stiffness – tension, compression and shear stresses – Hooke's law and simple problems – compound bars – thermal stresses – elastic constants and poission's ratio – welded joints – design.

UNIT II TRANSVERSE LOADING ON BEAMS 9

Beams – support conditions – types of Beams – transverse loading on beams – shear force and bending moment in beams – analysis of cantilevers, simply – supported beams and over hanging beams – relationships between loading, S.F. and B.M. In beams and their applications – S.F.& B.M. diagrams.

UNIT III DEFLECTIONS OF BEAMS 9

Double integration method – Macaulay's method – Area – moment theorems for computation of slopes and deflections in beams – conjugate beam method

UNIT IV STRESSES IN BEAMS **9**

Theory of simple bending – assumptions and derivation of bending equation (M/I = F/Y = E/R) – analysis of stresses in beams – loads carrying capacity of beams – proportioning beam sections – leaf springs – flitched beams – shear stress distribution in beams – determination of shear stress in flanged beams.

UNIT V TORSION **9**

Torsion of circular shafts – derivation of torsion equation (T/J = C/R = G0/L) – stress and deformation in circular and hollow shafts – stresses and deformation in circular and hollow shafts – stepped shafts – shafts fixed at both ends – stresses in helical springs – deflection of springs – spring constant

COLUMNS

Axially loaded short columns – columns of unsymmetrical sections – Euler's theory of long columns – critical loads for prismatic columns with different end conditions – effect of eccentricity.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Junarkar, S.B., Mechanics of Structure Vol. 1, 21st Edition, Character Publishing House, Anand, Indian, (1995)
2. William A.Nash, Theory and Problems of Strength of Materials, Schaum's Outline Series. McGraw Hill International Editions, Third Edition, 1994.

REFERENCE

1. Elangovan, A., Thinma Visai Iyal (Mechanics of Solids in Tamil), Anna University, Madras, 1995.

EE9213 ELECTRICAL DRIVES AND CONTROLS **L T P C**
3 0 0 3

UNIT I INTRODUCTION **9**

Fundamentals of Electrical Drives, advantages of Electrical Drives. Choice of an Electric Drive – characteristics of loads. Components of an Electric Drive: Electrical Motors – power converters (AC to DC, DC to DC, DC to AC, AC to AC) – Control units (Fuses, Switches, Circuit breakers, contactors and relays). Equations governing motor load dynamics – equilibrium operating point and its steady state stability.

UNIT II HEATING AND POWER RATING OF MOTOR DRIVE **9**

Load diagram, heating and cooling of motors – classes of motor duty. Determination of rating for continuous, intermittent and short time duty cycles.

UNIT III POWER CONVERTERS **9**

Control rectifiers – single phase and three phase circuits – choppers – step up and step down choppers – A.C. Voltage controllers. Single phase and three phase A.C. Voltage controllers, Inverters: Voltage source and current source inverters(Elementary Treatment only).

UNIT IV D.C. MOTOR DRIVE **9**

D.C. Motor: Types, speed – torque characteristics. Starting – braking – speed control: Armature voltage – field current control – Ward Leonard methods – Four-quadrant operation. Converter fed separately excited D.C. motor drive – chopper fed D.C. motor drive (Continuous current operation only).

UNIT V A.C. DRIVES 9

Principle of operation of 3 phase induction motor – equivalent circuit – Slip – torque characteristic – starting methods: star – Delta starter, Auto transformer starter, Rotor resistance starter, Speed control: Stator voltage control, frequency control, rotor resistance control, slip-power recovery scheme. Inverter fed 3-phase induction motor drive: v/f control, Rotor resistance control, slip-power recovery controls.

TOTAL : 45 PERIODS

TEXT BOOKS

1. G.K. Dubey, Power Semi Conductor Controller Drives. Prentice Hall of India 1989.
2. S.K.Pillai, A First Course on Electrical Drives. Wiley Eastern Ltd., 1993.

REFERENCES

1. P.C. Sen – Principles of Electric Machines and Power Electronics. John – Willey and Sons– 1997.
2. S.K. Bhattacharya and Brijinder Singh, Control of Electrical Machines, New Age International Publishers.

TT9201 PHYSICAL STRUCTURE AND PROPERTIES OF FIBRES L T P C
3 0 0 3

UNIT I STRUCTURAL INVESTIGATION OF FIBRES 12

Study of natural and man-made fibres – physical, chemical and morphological structure; study of investigation techniques – scanning electron microscope, X-ray diffraction, infrared radiation and dichroism.

UNIT II MOISTURE ABSORPTION IN FIBRES 6

Moisture absorption behaviour of natural and man-made fibres; influence of fibre structure, relative humidity and temperature; heat of sorption – integral and differential, their relation; factors influencing heat of sorption; conditioning of fibres – mechanism, factors influencing conditioning.

UNIT III MECHANICAL PROPERTIES OF FIBRES 10

Tensile characteristics – stress-strain relations, influence of humidity and temperature on tensile characteristics; elastic properties – elastic recovery and its relation to stress and strain of fibres; mechanical conditioning and its influence on elastic recovery of fibres; torsional rigidity of fibres – measurement techniques; flexural rigidity of fibres – measurement techniques.

UNIT IV OPTICAL PROPERTIES AND FRICTIONAL PROPERTIES 7

Luster index; refractive index and its measurement; birefringence, factors influencing birefringence; friction and its measurement, comparison of fibres, directional friction in wool.

UNIT V ELECTRICAL AND THERMAL PROPERTIES 10

Electrical resistance of fibres– measurement, factors influencing electrical resistance; di-electricity–factors influencing di-electricity; static electricity–measurement, problems and elimination techniques; thermal conductivity, thermal expansion and contraction, melting.

TOTAL : 45 PERIODS

REFERENCES

1. Morton W. E. and Hearle J. W. S., "Physical Properties of Textile Fibres", The Textile Institute, Manchester, U.K., 1993. ISBN:1870812417.
2. Meredith R. and Hearle J. W. S., "Physical Methods of Investigation of Textiles", Wiley Publication, New York, 1989.
3. Meredith R., "Mechanical Properties of Textile Fibres", North Holland, Amsterdam, 1986.
4. Hearle J. W. S. Lomas B. and Cooke W. D., "Atlas of Fibre Fracture and Damage to Textiles", The Textile Institute, 2nd Edition, 1998, ISBN: 1855733196.
5. Raheel M. (ed.), "Modern Textile Characterization Methods", Marcel Dekker, 1995 ISBN:0824794737.
6. Mukhopadhyay S. K., "The Structure and Properties of Typical Melt Spun Fibres", Textile Progress, Vol 18, No 4, The Textile Institute, 1989. ISBN: 1870812115.
7. Mukhopadhyay S. K., "Advances in Fibre Science" The Textile Institute, 1992, ISBN: 1870812379.
8. Hearle J.W.S., "Polymers and Their Properties, Vol.1. Fundamentals of structures and mechanics", Ellis Horwood, England, 1982.
9. Greaves P.H. and Aville B.P., "Microscopy of Textile Fibres", Bios Scientific, U.K., 1995.
10. Saville "Physical Testing of Textiles", M. K. Book Distributors, 1998.

EE9214 ELECTRICAL ENGINEERING LABORATORY L T P C
0 0 3 2

AIM

To provide the practical knowledge and control methods of electrical machines

OBJECTIVE

To impart practical knowledge on

I. Characteristic of different machines
II. Method of speed control of machines
III. Measurement of various electrical parameters

1. Study of DC & AC Starters
2. Study of Transducers
3. Wheatstone Bridge and Schering Bridge
4. ADC and DAC Converters
5. Speed Control of DC Shunt Motor
6. Load Test on DC Shunt Motor
7. OCC & Load Characteristics of DC Shunt Generator
8. Load Test on Single-Phase Transformer
9. Load Test on Three-Phase Induction Motor
10. Load Test on Single-Phase Induction Motor.

TOTAL : 45 PERIODS

CY9214 **INSTRUMENTAL METHODS OF ANALYSIS LAB** **L T P C**
(Common for IBT, Food and Pharmaceutical Technology) **0 0 4 2**

1. Precision and validity in an experiment using absorption spectroscopy .
2. Validating Lambert-Beer's law using $KMnO_4$
3. Finding the molar absorbtivity and stoichiometry of the Fe (1,10 phenanthroline)3 using absorption spectrometry.
4. Finding the pKa of 4-nitrophenol using absorption spectroscopy.
5. UV spectra of nucleic acids.
6. Chemical actinometry using potassium ferrioxolate.
7. Estimation of SO_4^{--} by nephelometry.
8. Estimation of Al^{3+} by flourimetry.
9. Limits of detection using aluminium alizarin complex.
10. Chromatography analysis using TLC.
11. Chromatography analysis using column chromatography.

TOTAL : 60 PERIODS

TEXT BOOKS

1. Skoog, D.A. etal. "Principles of Instrumental Analysis", 5th Edition, Thomson / Brooks – Cole,1998.
2. Braun, R.D. "Introduction to Instrumental Analysis", Pharma Book Syndicate, 1987.
3. Willard, H.H. etal. "Instrumental Methods of Analysis", 6th Edition, CBS, 1986.
4. Ewing,G.W. "Instrumental Methods of Chemical Analysis", 5th Edition, McGraw-Hill, 1985.

MA9261 **PROBABILITY AND STATISTICS** **L T P C**
3 1 0 4

AIM

This course aims at providing the required skill to apply the statistical tools in engineering problems.

OBJECTIVES

- The students will have a fundamental knowledge of the concepts of probability.
- Have knowledge of standard distributions which can describe real life phenomenon.
- Have the notion of sampling distributions and statistical techniques used in management problems.

UNIT I RANDOM VARIABLES **9 + 3**

Discrete and Continuous random variables – Moments – Moment generating functions – Binomial, Poisson, Geometric, Uniform, Exponential, Gamma, Weibull and Normal distributions - Functions of a random variable.

UNIT II TWO-DIMENSIONAL RANDOM VARIABLES **9 + 3**

Joint distributions – Marginal and Conditional distributions – Covariance – Correlation and Linear regression – Transformation of random variables – Central limit theorem (for independent and identically distributed random variables).

UNIT III TESTING OF HYPOTHESIS 9 + 3

Sampling distributions - Tests for single mean, proportion, Difference of means (large and small samples) – Tests for single variance and equality of variances – χ^2-test for goodness of fit – Independence of attributes – Non-parametric tests: Test for Randomness and Rank-sum test (Wilcoxon test).

UNIT IV DESIGN OF EXPERIMENTS 9 + 3

Completely randomized design – Randomized block design – Latin square design - 2^2 - factorial design.

UNIT V STATISTICAL QUALITY CONTROL 9 + 3

Control charts for measurements ($\overline{X}$ and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

L : 45 , T : 15 , TOTAL : 60 PERIODS

TEXT BOOKS

1. Milton, J. S. and Arnold, J.C., "Introduction to Probability and Statistics", Tata McGraw Hill, 4th edition, (2007).
2. Johnson, R.A. and Gupta, C.B., "Miller and Freund's Probability and Statistics for Engineers", Pearson Education, Asia, 7th edition, (2007).

REFERENCES

1. Devore, J.L., "Probability and Statistics for Engineering and the Sciences", Thomson Brooks/Cole, International Student Edition, 7th edition, (2008).
2. Walpole, R.E., Myers, R.H., Myers, S.L. and Ye, K., "Probability and Statistics for Engineers and Scientists", Pearson Education, Asia , 8th edition, (2007).
3. Ross, S.M., "Introduction to Probability and Statistics for Engineers and Scientists, 3rd edition, Elsevier, (2004).
4. Spiegel, M.R., Schiller, J. and Srinivasan, R.A., "Schaum's Outline of Theory and Problems of Probability and Statistics", Tata McGraw Hill edition, (2004).

CY9261 PHYSICAL CHEMSITRY

(Common to Chemical, Textile, Leather and Petroleum Refining & Petrochemicals)

L	T	P	C
3	0	0	3

AIM

To know the basic concepts of physical chemistry and its applications.

OBJECTIVES

- To acquire knowledge in the field of electrochemistry, solubility behaviour, chemical reaction kinetics, photochemical reactions and colloidal chemistry towards different applications.

UNIT I ELECTROCHEMISTRY 9

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: Fuel cells – Hydrogen -Oxygen fuel cell – Chemical and electrochemical corrosion – Corrosion control – Different methods.

UNIT II IONIC EQUILIBRIA 9

Acids and bases – Arrhenius concept – Lewis concept – Dissociation of weak acid, weak base – Ionic product of water – Buffer solutions – calculation of pH – Henderson's equation – Hydrolysis of salts – Degree of hydrolysis – Determination – acid-base indicators – their applications – solubility product principle – Ionic equilibria involving complex ions.

UNIT III CHEMICAL KINETICS 9

Order of a reaction – Zero order, First order, Second order and Third order reactions – Molecualrity of a reaction – Unimolecular and Bimolecular reactions – Experimental methods of determining order of a reaction – Kinetics of parallel and opposing reactions – Concept of activation energy – Arrhenius equation – Collision theory of reaction rates – Theory of absolute reaction rates – Kinetics of enzyme catalyzed reactions.

UNIT IV PHOTOCHEMISTRY 9

Laws of Photochemistry, Quantum efficiency, Photochemical reactions, Actinometry, Kinetics and mechanism of Hydrogen – Bromine reaction, Hydrogen – Chlorine reaction – Photosensitization, Chemiluminscence.

UNIT V COLLOIDS 9

Introduction to colloids – properties of colloids – coagulation of solutions – Origin of charge on colloidal particles – Determination of size of colloidal particles – Donnan Membrane equilibrium – Emulsions – Gels – Applications of colloids – Nanoparticles (Au, Ag, Pt) – Preparation – Characterization – Properties – Application in catalysis and drug delivery systems.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Kund and Jain, Physical Chemistry, S.Chand and Company, New Delhi (1996).
2. Puri B.H. Sharma L.R. and M.S.Prathama, "Principles of Physical Chemisry", S.Chand and Company, New Delhi (2001).
3. B.S.Bahl, Arun Bahl and G.D.Tuli, "Essentials of Physical Chemistry", S.Chand and Company, New Delhi (2005).

REFERENCES

1. Gordon M. Barrow, Physical Chemistry, Sixth Edition, Tata McGraw Hill (1998).
2. Peter Atkins & Julio de Paula, Atkins' Physical Chemistry, 7th Edition, Offord university press. (2002).

CH9204 BASIC MECHANICAL ENGINEERING L T P C
3 0 0 3

AIM

To impart knowledge on thermodynamics and thermal engineering power generating units such as engines and theory of machines

OBJECTIVE

- Students should learn thermodynamics and thermal engineering to understand the principles behind the operation of thermal equipments like IC engines and turbines etc., Students should be able to appreciate the theory behind operation of machinery and be able to design simple mechanisms

UNIT I LAWS OF THERMODYNAMICS 10

Basic concepts and hints; Zeroth law; First Law of Thermodynamics - Statement and application; Steady flow energy equation-problems- Second law of Thermodynamics – Kelvin - Plank statement and Clausius statement- problems; Limitations; Heat Engine, Refrigerator and Heat Pump, Available energy, Equivalence entropy; Reversibility: Entropy charts; Third law of Thermodynamics - Statement.

UNIT II HEATING AND EXPANSION OF GASES 6

Expressions for work done, Internal energy and heat transfer for Constant Pressure, Constant Volume, Isothermal, Adiabatic and Polytropic processes-Derivations and problems; Free expansion and Throttling process.

UNIT III AIR STANDARD CYCLES 6

Carnot cycle; Stirlings cycle; Joule cycle; Otto cycle; Diesel cycle; Dual combustion Cycle-Derivations and problems.

UNIT IV I.C. ENGINES, STEAM AND ITS PROPERTIES AND STEAM TURBINES 12

Engine nomenclature and classification; SI Engine; CI Engine; Four Stroke cycle, Two stroke cycle; Performance of I.C.Engine; Brake thermal efficiency; Indicated Thermal Efficiency, Specific fuel consumption. Steam - Properties of steam; Dryness fraction; latent heat; Total heat of wet steam; Dry steam; Superheated steam. Use of steam tables; volume of wet steam, volume of superheated steam; External work of evaporation; Internal energy; Entropy of vapour, Expansion of vapour, Rankine cycle.Steam turbines – Impulse and Reaction types - Principles of operation.

UNIT V SIMPLE MECHANISM, FLY WHEEL, DRIVES AND BALANCING 11

Definition of Kinematic Links, Pairs and Kinematic Chains; Working principle of Slider Crank mechanism and inversions; Double slider crank mechanism and inversions. Flywheel -Turning moment Diagram; Fluctuation of Energy.Belt and rope drives; Velocity ratio; slip; Creep; Ratio of tensions; Length of belt; Power Transmitted; gear trains-types.Balancing of rotating masses in same plane; Balancing of masses rotating in different planes.

TOTAL : 45 PERIODS

TEXT BOOKS

1. Nag, P.K., " Engineering Thermodynamics ", II Edition, Tata McGraw Hill Publishing Co., Ltd., 1995.
2. Rajput, R .K, “Thermal Engineering”, Laxmi publications (P) Ltd, 2001.
3. Khurmi R.S., and Gupta J.K, “Theory of Machines”, Eurasia Publishing House (P) Ltd., 2004.

REFERENCES

1. Smith, " Chemical Thermodynamics ", Reinhold Publishing Co., 1977.
2. Bhaskaran, K.A., and Venkatesh, A., " Engineering Thermodynamics ",Tata McGraw Hill, 1973.
3. Pandya A. and Shah, " Theory of Machines ", Charatakar Publishers, 1975.
4. Khurmi R.S., and Gupta J.K, “Thermal Engineering”, S.Chand & Company (P) Ltd.,2001.
5. Kothandaraman and Dhomkundwar,”: A course in Thermal Engineering (SI Units)”, Dhanpat Rai and Sons, Delhi (2001)

TT9251 SPUN YARN TECHNOLOGY I L T P C
4 0 0 4

UNIT I INTRODUCTION 12

Sequence of spinning machinery for producing carded, combed and blended yarns in short staple and long staple spinning system; yarn numbering systems- direct, indirect and conversions; influence of characteristics of raw material – fibre fineness, length, strength, elongation, stiffness, fibre friction, cleanness on spinning; spinnability.

UNIT II GINNING AND BLOWROOM MACHINERY 12

Description and working of different types of gins; selection of right type of gins; ginning performance on yarn quality; objects, principle and description of opening, cleaning and blending machines used in blowroom; chute feed; cleaning efficiency; neps and fibre rupture; waste control; process control; production calculations.

UNIT III CARD 12

Objects and principle of carding; detailed study of flat card; card clothing and its maintenance; drives and production calculation; neps, waste and quality control.

UNIT IV COMBER 12

Objectives of comber preparatory; detailed study of sliver lap, ribbon lap and super lap formers; objects and principles of combing; sequence of combing operation; combing efficiency and production calculation; hooks and neps removal, noil control, quality control.

UNIT V DRAWFRAME AND SPEEDFRAME 12

Tasks of drawframe; drafting systems used in modern drawframes; draft and production calculation; objects of speed frame; working of speed frame; bobbin builder mechanism – mechanical and electro-mechanical; draft, twist and production calculations; quality control in draw frame and speed frame.

L : 45 , T : 15 , TOTAL : 60 PERIODS

REFERENCES

1. Oxtoby E., "Spun Yarn Technology ", Butterworth, London, 1987.
2. Klein W., "The Technology of Short-staple Spinning ", The Textile Institute, Manchester , 1998.
3. Klein W., "A Practical Guide to Opening and Carding ", The Textile Institute, Manchester, 1999.
4. Klein W., "A Practical Guide to Combing, Drawing and Roving Frame ", The Textile Institute, Manchester, 1999.
5. Lord P.R., "Yarn Production: Science, Technology and Economics ", The Textile Institute, Manchester, 1999.
6. Salhotra K.R. and Chattopadhyay R., "Book of papers on Blowroom and Card ", Indian Institute of Technology, Delhi, 1998.
7. Iredale J., "Yarn Preparation: A Handbook ", Intermediate Technology, 1992.
8. Doraiswamy I., Chellamani P. and Pavendhan A., "Cotton Ginning, Textile Progress ", The Textile Institute, Manchester, 1993.

TT9252 TECHNOLOGY OF FABRIC MANUFACTURE I L T P C
4 0 0 4

UNIT I PREPARATION OF YARN FOR WEAVING 14

Process flow diagram for different types of fabric, (e.g. Plain, Stripes, Checked, dyed, Printed, denim, etc with alternate routes); objects of winding; principles of cheese and cone winding machines; uniform build of yarn package; types of drums – half accelerated and fully accelerated drums; control of balloons; study of modern automatic winders; classification of yarn faults and its removal; concepts in yarn clearing – mechanical, optical and electronic clearers, knotters and splicers; data systems; faults in wound packages, their causes and remedies; winding synthetic and blended yarns and sewing threads; weft winding; winding for colouration; quality of knots and splices; winding performance; productivity;maintenance; quality control; material handling.

UNIT II PREPARTION OF BEAM FOR WEAVING 14

Objective of warping, material flow in beam warping and creels used in warping machines; sectional warping machines (passage, conventional, modern sectional warping machine, volume issues and calculation); process control in warping (production calculation, machine and labor productivity, control of end breaks, quality and hard waste in warping); objects of sizing; sizing materials and recipes used for different types of fibers; size preparation equipment; sizing machines; control systems used in sizing machine; sizing filament yarns; concept of single end sizing, combined dyeing and sizing; energy conservation in sizing; process control in sizing, add-on percentage calculation; modern concepts in sizing (one sort sizing, Foam sizing, solvent sizing, prewet sizing, etc.), modern sizing machine; need for drawing-in operation; manual and automatic drawing- in, leasing, knotting and pinning machines; selection and care of reeds, healds and drop pins, control of cross ends and extra ends and calculations.

UNIT III INTRODUCTION TO WEAVING AND SHEDDING MOTIONS 18

Principle of weaving with hand and power looms, passage of material, various motions– primary, secondary and auxiliary motions, various shafts and plain power loom driving, timing of motions; shed geometry and shedding requirement, principles of tappet, dobby and jacquard shedding mechanisms, positive and negative shedding mechanisms, reversing mechanisms and force diagram, limitations of various shedding mechanisms, types of shed; developments from principle dobby mechanism to electronic dobby; developments from principle jacquard mechanism to electronic jacquard .

UNIT IV SHUTTLE PICKING AND BEAT UP 9

Shuttle picking mechanisms, shuttle flight and timing, acceleration and retardation of the shuttle, power required for picking; kinematics of sley, sley eccentricity; beat up mechanism in modern looms; timing of the primary motions in plain looms.

UNIT V SECONDARY AND AUXILARY MOTIONS IN PLAIN LOOMS 5

Take up and let - off motions used in power looms; cloth formation, weaving condition - factors and control; warp protector and warp and weft stop motion; plain loom accessories.

L : 45 , T : 15 , TOTAL : 60 PERIODS

REFERENCES

1. Talukdar M.K., Sriramulu P.K. and Ajgaonkar D.B., "Weaving: Machines, Mechanisms, Management", Mahajan Publishers, Ahmedabad, 1998, ISBN: 81-85401-16-0
2. Ajgaonkar D.B., Talukdar M.K. and Wadekar., "Sizing * Materials * Methods * Machines", 2nd Edition, Mhajan Publishers, Ahmedabad. 1999.
3. "Weaving: The knowledge in technology", Papers presented at the Textile Institute Weaving Conference 1998, textile Institute, ISBN: 18770372182.
4. Booth J.E., "Textile Mathematics-Volume 3", The Textile Institute, Manchester, 1977, ISBN: 090073924X

5. “Yarn Preparation: A Hand Book”, Textile Institute, Manchester, 1992, ISBN: 1853390429.
6. Marks R. and Robinson T.C., “Principles of weaving”, The Textile Institute, Manchester, 1989, ISBN: 0 900739 258.
7. Lord P.R. and Mohamed M.H., “Weaving: Conversion of yarn to fabric”, Merrow, 1992, ISBN: 090409538X
8. Ormerod A. and Sondhelm W.S., “Weaving: Technology and operations”, Textile Institute, 1995, ISBN: 187081276X

TT9253 **FABRIC STRUCTURE** **L T P C**
3 0 0 3

UNIT I **9**

Elementary weaves – plain and its derivatives; twill and its derivatives; satin, sateen and their derivatives.

UNIT II **9**

Ordinary and Brighten Honey Comb; Huck-a-Back and its modifications; Mock Leno; crepe weaves; colour theory – light and pigment theory; modification of colour; application of colours; colour and weave effects.

UNIT III **9**

Bedford cords - plain and twill faced, wadded; welts and piques, wadded piques; backed fabrics - warp and weft, reversible and non-reversible fabrics; extra warp and extra weft figuring - single colour and double colour.

UNIT IV **9**

Pile fabrics; warp pile - wire pile, terry pile, loose backed; weft pile – plain back and twill back velveteen, lashed pile, corduroy, weft plush.

UNIT V **9**

Double cloth, types of stiches; Damasks; Gauze and Leno principles.

TOTAL : 45 PERIODS

REFERENCES

1. Grosicki Z. J., “Watson’s Textile Design and Colour”, Vol.1, Butterworths, London, 1989.
2. Grosicki Z. J., “Watson’s Advanced Textile Design and Colour”, Vol.II, Butterworths, London, 1989
3. Wilson J., “Handbook of Textile Design”, Textile Institute, Manchester, 2001, ISBN:1 85573 5733
4. Horne C.E., “Geometric Symmetry in Patterns and Tilings”, Textile Institute,Manchester, 2000, ISBN:1 85573 4923.
5. Seyam A. M., “Structural Design of Woven Fabrics, Theory and Practice”, Textile Institute, Manchester, 2002, ISBN: 1 87037 2395.
6. Georner D, “Woven Structure and Design, part 1:Single Cloth Construction”, WIRA, U.K., 1986.
7. Georner D, “Woven Structure and Design, Part 2: Compound Structures”, WIRA, U.K.,1989.

CH9257 **MECHANICAL ENGINEERING LAB** **L T P C**
0 0 4 2

AIM

To impart practical knowledge in operating IC engines and conduct experiments. To understand test procedures in testing material for engineering applications

OBJECTIVES

- Students will be able to understand Power-generating units such as engines and operate IC engines and conduct tests. They will be able to appreciate the theory behind the functioning of engines. Material properties, their behavior under different kinds of loading and testing can be visualized.

LIST OF EXPERIMENTS *

1. Port timing diagram
2. Valve timing diagram
3. Study of 2,4 stroke I C Engines
4. Load test on 4-stroke petrol engine
5. Performance test on 4-stroke single cylinder diesel engine
6. Performance test on 4-stroke twin cylinder diesel engine
7. Heat balance test on diesel engines
8. Tension test
9. Compression test
10. Deflection test
11. Hardness test (Rockwell and Brinell)
12. Spring test
13. Torsion test
14. Impact test

TOTAL : 60 PERIODS

* Minimum 10 experiments shall be offered

TT9254 **FIBRE SCIENCE LAB** **L T P C**
0 0 3 2

LIST OF EXPERIMENTS

1. End group analysis of polymers using chemical methods
2. Estimation of Molecular Weight of textile polymers
3. Drying of chips for melt production
4. Viscosity studies on fibre melts
5. Melt flow index of polypropylene
6. Determination of count of fibres
7. Determination of Density of Fibres
8. Determination of Thermal transitions of textile polymers
9. Thermogravimetric analysis of fibres
10. Determination of crystallinity and molecular orientation of fibres
11. Determination of Moisture Regain and Moisture content of fibres
12. Microscopic studies of textile fibres
13. FTIR analysis of polymers and fibres
14. Burning Tests of Fibres
15. Identification of Fibres using chemical methods

Identification and estimation of blend proportion of fibres

TOTAL : 45 PERIODS

TT 9301 HIGH PERFORMANCE FIBERS LT P C
3 0 0 3

UNIT I LINEAR POLYMER FIBRES 9

Spinning of aramid, high modulus-high tenacity polyethylene and other such fibres; their structure, properties and applications

UNIT II CARBON FIBRE 9

Manufacture of PAN-based, Pitch-based carbon fibres; physical properties and applications; carbon nanotubes and applications

UNIT III GLASS FIBRE 9

Fibre manufacture; fibre properties; glass-fibre composites and other applications

UNIT IV CERAMIC AND OTHER HIGH PERFORMANCE FIBRES 9

Manufacture of ceramic fibres; production of chemically resistant fibres and thermally resistant fibres

UNIT V SPECIALITY FIBRES 9

Hollow and profile fibres; blended and bi-component fibres; super absorbent fibres; film fibres

TOTAL : 45 PERIODS

REFERENCES

1. Kothari V.K., “Textile Fibres: Development and Innovations”, Progress in Textiles, Vol. 2, IAFL Publications, 2000.
2. Hearle J.W.S., “High Performance Fibres”, Woodhead Publishing Ltd, Cambridge, England, 2001.
3. Peebles L.H., “Carbon Fibres”, CRC Press, London, 1995.
4. Hongu T. and Phillips G.O., “New Fibres”, Woodhead Publishing Ltd., England, 1997.

TT 9302 SPUN YARN TECHNOLOGY II L T P C
3 0 0 3

UNIT I RING FRAME 14

Principle of yarn formation in ring machines; working of ring frame; cop building; design features of important elements used in ring frame; draft, twist and production calculations in ring frame; end breakage rate – causes and remedies; quality control

UNIT II YARN FOLDING 9

Merits of two-folding of yarns; methods followed for two-folding – TFO, ring twisting; selection of twist level for two-folding; calculation of resultant count of two-folded yarns; types of fancy yarns, method of production

UNIT III CONDENSED YARN SPINNING 9

Principle of condensed yarn spinning, its effect on yarn formation at spinning triangle; different methods of production; advantage of condensed yarn

UNIT IV NEW SPINNING TECHNOLOGIES 13

Principle of open end spinning; technologies of yarn production by using OE spinning system; principle of yarn production by rotor, friction and air-jet spinning methods, raw material used, structure, properties and applications; principle of yarn production by self-twist, wrap, integrated compound spinning systems.

TOTAL : 45 PERIODS

REFERENCES
1. Oxtoby E., "Spun Yarn Technology ", Butterworth Publications, London, 1987.
2. Klein W., "The Technology of Short-staple Spinning", The Textile Institute, Manchester, 1998.
3. Klein W., "A Practical Guide to Ring Spinning ", The Textile Institute, Manchester, 1999.
4. Klein W., "New Spinning Systems ", The Textile Institute, Manchester, 1993.
5. Lord P.R., " Yarn Production: Science, Technology and Economics ", The Textile Institute, Manchester, 1999.
6. Shaw J., "Short-staple Ring Spinning, Textile Progress", The Textile Institute, Manchester, 1982.
7. Iredale J., "Yarn Preparation: A Handbook ", Intermediate Technology, 1992.

TT 9303 TECHNOLOGY OF FABRIC MANUFACTURE II L T P C
3 0 0 3

UNIT I PREPARATIONS FOR HIGH SPEED WEAVING 5

Yarns quality requirements for high speed automatic shuttle looms and shuttle less loom; warp and weft preparation for high speed looms

UNIT II AUTOMATIC SHUTTLE LOOMS 10

Automatic weft replenishment in shuttle looms – pirn changing and shuttle changing looms; mechanisms involved in automatic pirn changing – feelers, cutters, design of shuttle, three try motions; multi shuttle looms- eccentric & lever box changing principle, system overview of multi box loom with cop changing mechanism; pile fabric weaving principle looms; tape weaving

UNIT III SHUTTLELESS LOOMS 23

Principles of weft insertions in shuttle less looms; selvedges used in shuttle less looms; weft feeder – types, passage of material; mechanism of weft insertion by projectile, gripper cycle; rapier loom-classification, weft insertion mechanism, devices timings, pile fabric production.

Water jet weft insertion; Air jet Loom – dynamics of weft insertion, jet energy, loss and transfer to yarn related derivations, developments for high speed and width operation of loom; weft arrival control and automation; selvedge devices (ISD, RLD, ELD)technologies, advantages and disadvantages

Shedding devices for shuttleless looms; drive technologies consideration in looms; techno economics of shuttle less loom weft insertion systems; Multi-Phase weaving systems; quick style change; loom monitoring and control

UNIT IV PROCESS CONTROL IN WEAVING 7

Loom stoppages and efficiency; fabric defects and value loss; fabric shrinkage in the loom-causes and control; fabric engineering.

TOTAL : 45 PERIODS

REFERENCES
1. Sabit Adanur, “Handbook of weaving”, Technomic Publishing Co. Inc., 2001
2. Marks R. and Robinson T.C., “Principles of weaving”, The Textile Institute, Manchester, 1989, ISBN: 0 900739 25 8.
3. Talukdar M.K., Sriramulu P.K. and Ajgaonkar D.B., “Weaving: Machines, Mechanisms, Management”, Mahajan Publishers, Ahmedabad, 1998, ISBN: 81-85401-16-0
4. Lord P.R. and Mohamed M.H., “Weaving: Conversion of yarn to fabric”, Merrow, 1992, ISBN: 090409538X
5. Vangheluwe L., “Air- jet weft insertion”, Textile progress, Vol. 29, No 4, Textile Institute Publication, 1999, ISBN; 1870372255.
6. Lunenschloss J., Albrecht W. and David Sharp, “Non-woven Bonded Fabrics”, Ellis Harwood Ltd, New York, 1985, ISBN: 0-85312-636-4.
7. “Weaving: The knowledge in technology”, Textile Institute, Manchester, 1998, ISBN: 18703721

TT 9304 CHEMICAL PROCESSING OF TEXTILES AND APPARELS I L T P C
3 0 0 3

UNIT I STRUCTURE AND PROPERTIES 5

Chemical structure and chemical properties of cotton, flax, wool, silk, viscose, polyester, nylon, acrylic, polypropylene and polyurethane

UNIT II GREY PREPARATION – I 9

Singeing; desizing - hydrolytic and oxidative techniques; scouring - natural and synthetic fibres; application of biotechnology

UNIT III GREY PREPARATION – II 9

Mercerization - action of alkali on cellulose, cold and hot mercerization; bleaching; heat setting

UNIT IV PROCESSING MACHINES 13

Loose stock machine; hank and package machines; yarn singeing machine - gas singeing machine; shearing and raising machines; kiers; mangles; jigger; winch; jet and soft flow machines; yarn mercerizer, chain and chainless mercerizers; continuous scouring and bleaching machines; washing ranges, hydro extractors; detwisters; dryers; stenters and stretching devices

UNIT V FINISHING 9

Calendering; crease proofing; anti-shrinking; softening; felting and non-felting of wool; application of biotechnology

TOTAL : 45 PERIODS

REFERENCES

1. Trotman E. R., “Dyeing and chemical technology of textile fibres”, B.I Publishing Pvt. Ltd, New Delhi, 1994.
2. Menachem Lewin and Eli M. Pearce, “Handbook of fibre chemistry: Second Edition, Revised and Expanded, Marcel Dekker, Inc., 1998.
3. Menachem Lewin and Stephen B. Sello., “Handbook of fibre science and technology: volume I: Chemical Processing of Fibres and Fabrics-Fundamentals and Preparation
4. Part A”, Marcel Dekker, INc., 1983.
5. Karmakar S. R., “Chemical Technology in the Pre-treatment Process of Textiles”,
6. Elsevier sciences B.V.,1999.
7. Shenai V. A., “Technology of Bleaching and Mercerizing”, Sevak Publications, 2003.
8. Bhagwat R. S., “Handbook of Textile Processing”, Colour Publication, Mumbai.,1999.
9. Cavaco-Paulo A. and Gubitz G. M., “Textile Processing with enzymes”, WoodheadPublication Ltd., 2003.
10. Shenai V. A., “Technology of Textile Finishing”, B.I. Publication, Mumbai, 1989.
11. Heywood D., “Textile Finishing”, Woodhead Publishing Ltd., 2003, ISBN 0 901956 81 3.

TT 9305 KNITTING TECHNOLOGY L T P C
4 0 0 4

UNIT I INTRODUCTION 6

Comparison between different types of fabrics - wovens, knits and bonded fabrics; classification of knitting processes; yarn quality requirements for knitting and its preparation

UNIT II FUNDAMENTALS OF WEFT KNITTING 12

General definitions and principles of knitting; knitting needles; elements of knitted loop structure; fundamentals of formation of knit, tuck and float stitches; basic knitted structures and their production - plain, rib, interlock and purl; knitted fabric geometry

UNIT III CIRCULAR KNITTING 18

Construction and working of circular knitting machines used for the production of basic structures; production of derivatives of weft knitted structures; needle control in circular knitting machines; factors affecting the formation of loop; effect of loop length and shape on fabric properties; quality control in knitted fabric production; production calculation

UNIT IV FLAT KNITTING 12

Basic principles; elements of flat knitting machines; different types of flat knitting machines - manual, mechanical and computer controlled; production of various fabric structures

UNIT V WARP KNITTING 12

Basic principles; machine classification; preparation of yarns for warp knitting; production of elementary structures

L : 45 , T : 15 , TOTAL : 60 PERIODS

REFERENCES

1. Ajgaonkar D.B., "Knitting technology", Universal Publishing Corporation, Mumbai, 1998, ISBN: 81-85027-34-X.
2. Chandrasekhar Iyer, Bernd Mammel and Wolfgang Schach., "Circular knitting", Meisenbach GmbH, Bamberg, 1995, ISBN: 3-87525-066-4.
3. Spencer D.J., "Knitting Technology", III Ed., Textile Institute, Manchester, 2001, ISBN: 1 85573 333 1.
4. Samuel Raz., "Flat Knitting: The new generation", Meisenbach GmbH, Bamberg, ISBN: 3-87525-054-0.
5. Samuel Raz., "Warp knitting production", Melliand Textilberichte, GmbH, Rohrbacher, 1987, ISBN: 3-87529-022-4
6. Gajjap B.J., "Handbook of warp knitting technology", Textile Institute, Manchester, 2004, ISBN: 1 85573 7701

TT 9307 YARN MANUFACTURE LABORATORY L T P C
0 0 3 2

LIST OF EXPRIMENTS

1. Determination of hank of sliver and roving and count of yarn
2. Fibre trash analysis
3. Production of ring yarn samples
4. Production of rotor yarn samples

Study of

5. Material flow in Blow room line, settings and production calculations in blow room
6. Material flow in card, settings and production calculations
7. Material flow in draw frame, drafting system, loading arrangement settings, draft and production calculations
8. Material flow in comber, drafting system, loading arrangement settings, draft and production calculations
9. Combing cycle
10. Material flow in speed frame, drafting system, loading arrangement settings, draft, twist and production calculations
11. Material flow in ring frame, drafting system, loading arrangement settings, draft, twist and production calculations
12. Material flow in rotor spinning machine, settings, draft and production calculations
13. Builder mechanism in speed frame
14. Builder mechanism in ring frame.

TOTAL : 45 PERIODS

TT 9308 CLOTH ANALYSIS LABORATORY L T P C
0 0 3 2

Analysis of construction details like design, draft, peg plan, ends per inch, picks per inch, count of warp and weft yarns, warp and weft crimp, cover factor and cloth area density for the following woven fabrics.

1. Plain and its derivatives
2. Twill and its derivatives
3. Satin
4. Sateen
5. Honeycomb (ordinary and Brighton)
6. Huck-a-back
7. Extra warp and extra weft figuring
8. Pile fabrics (warp and weft)
9. Welts and Piques
10. Backed fabrics
11. Gauze and Leno
12. Double cloth
13. Crepe
14. Tapestry
15. Mock-leno
16. Bedford cord.

TOTAL : 45 PERIODS

TT 9351 CHEMICAL PROCESSING OF TEXTILES AND APPARELS II L T P C
3 0 0 3

UNIT I DYEING 18

Adsorption isotherms; dye-fibre interaction; properties and application of direct, azoic, vat, sulphur and reactive dyes; properties and application of acid, mordant, metal-complex, disperse and basic dyes; dyeing of blends

UNIT II PRINTING 9

Methods and styles of printing; printing machines; constituents of printing paste; printing with direct, reactive, acid and disperse dyes; printing with pigments

UNIT III ASSESSMENT OF COLOR AND FINISHES 13

Theories of colour measurement, Beer–Lambert's law and Kubelka-Munk theory; whiteness and yellowness indices and lustre measurement; assessment of finishes- crease proofing, anti-shrinking, softening; assessment of eco-friendliness of textiles

UNIT IV KNITS AND GARMENTS 5

Finishing of knits- machines and processes; Garment dyeing and washing

TOTAL : 45 PERIODS

REFERENCES

1. Trotman E. R., “Dyeing and chemical technology of textile fibres”, B.I Publishing Pvt Ltd, New Delhi, 1994.
2. Shenai V. A., “Chemistry of dyes and principles of dyeing”, Sevak Publications, Mumbai, 1995.
3. Shore J., “Colourants and auxiliaries: Volume I Colorants”, Woodhead Publishing Ltd 2002, ISBN 0 901956 77 5
4. Shore J., “Colourants and auxiliaries: Volume II Auxiliaries”, Woodhead Publishing Ltd, 2002, ISBN 0 901956 78 3
5. Cegerra J. Puente P. And Valladepears J., “The Dyeing of Textile Materials”, Textile Institute, Manchester, 1993.
6. Shenai V. A., “Technology of Printing”, Sevak Publications, Mumbai, 1996.
7. Miles W. C., “Textile Printing”, Woodhead Publication, 2003, ISBN 0 901956 76 1
8. Johnson A., “The Theory of Colouration of Textiles”, SDC, Second edition, 1989,ISBN 0 901956 481
9. Shah H. S. and Gandhi R. S., “Instrumental colour measurement and computer aided colour matching for textiles”, Mahajan Book Publication, 1990.

TT 9352 QUALITY ASSESSMENT OF TEXTILE PRODUCTS L T P C
3 0 0 3

UNIT I **9**

Introduction to quality control - definition of quality, importance of quality assessment; fabric inspection - independent product quality certification, acceptable quality level, MIL standards and final inspection; care labels - international care labeling system, Japan/Canada/British care labeling systems, eco labels; sampling plan and statistical application

UNIT II **13**

Cotton fibre testing - fibre length, strength, fineness, maturity and trash content; yarn testing - yarn numbering, crimp rigidity, strength, twist, evenness, hairiness and yarn appearance; course length determination, standards and test specifications used for testing

UNIT III **9**

Fabric testing - weight, strength, tensile strength, tearing strength, bursting, impact, abrasion resistance, pilling, crease recovery, stiffness, drapeability, air permeability, water permeability, flammability; objective evaluation of fabrics

UNIT IV **5**

Moisture and thermal properties; colour fastness testing – washing, light, rubbing, perspiration; shrinkage and dimensional stability

UNIT V **9**

Quality assessment of garments - cutting, sewing, pressing, finishing and package defects; analysis of specification sheet, rejection of goods by customers; inspection procedure; testing of garment accessories

TOTAL: 45 PERIODS

REFERENCES

1. Booth J.E., “Principle of textile testing”, Butterworth Publications, London, 1989.
2. Saville B.P., “Physical testing of textiles”, Textile Institute, Manschester, 1998.
3. Kothari V. K., “Testing and Quality management”, Progress in Textile Technology Vol.1, IAFL Publications, New Delhi, 1999.

4. Ruth clock and Grace Kunz., “Apparel manufacture – sewn product analysis”, Upper Sadle River Publications, New York, 2000.
5. Pradip V. Mehta., “Managing quality in the apparel industry”, NIFT Publication, India, 1998
6. Sara J. Kadolph., “Quality assurance for textiles and apparels”, Fair child Publications, New York, 1998.
7. Slater K., “Physical testing and quality control”, The Textile Institute, Vol.23, No.1/2/3 Manchester, 1993.

TT 9353 TECHNICAL TEXTILES L T P C
3 0 0 3

UNIT I TECHNICAL TEXTILES IN TRANSPORT, FISHING AND INDUSTRY 9

Design and characteristics required in textiles for transport applications like carpet, seat, air bag, belt, tyre, hose etc.; use of textile reinforced composites in transport sector; quality requirement of yarns used in fishing industry like nets, ropes; use of textiles in filters, conveyor belts, power transmission belts

UNIT II TECHNICAL TEXTILES IN MEDICAL, HYGIENE AND SPORTS 9

Design and characteristics required in textiles for medical and hygiene applications such as anti microbial fibres, operating room garments, disposable products, bandage and pressure garments, wound care materials, implantable devices; use of textiles in the sports field and by sports persons

UNIT III TECHNICAL TEXTILES IN HOME, CLOTHING COMPONENT AND PROTECTION 13

Design of textile materials used in furnishing, wadding, fibre fills, carpets, curtains, cleaning materials etc.; technology involved in the manufacture of sewing threads, interlinings etc.; garment design and choice of materials in protecting human from heat, flame, chemicals, cold, wind, static charge, bullets etc.

UNIT IV TECHNICAL TEXTILES IN CONSTRUCTION, GEO TECHNICAL APPLICATIONS AND ENVIRONMENT PROTECTION 14

Use of geo textiles in filtration, drainage, separation and reinforcement application in construction; type of fibre and fabric to be used in such applications; evaluation of geo textiles; use of textile materials in permanent and temporary civil construction - tents, awnings, sound and thermal insulation.

TOTAL : 45 PERIODS

REFERENCES

1. Anand S.C., “Medical Textiles”, Textile Institute, Manchester, 2001, ISBN:185573494X.
2. Mukhopadhyay S.K. and Partridge J.F., “Automotive Textiles”, Textile Progress, Vol.29, No1/2, 1999, ISBN:1870372212.
3. Horrocks A.R. and Anand S.C., “Handbook of Technical Textiles”, The Textile Institute, Manchester, 2000, ISBN: 1855733854.
4. Adanur S., “Wellington sears handbook of Industrial textiles”, Technomic publishing co inc., 1995, ISBN : 1–56676–340–1.
5. Pushpa Bajaj and Sengupta A.K, “Protective clothing”, The Textile Institute, Manchester, 1992, ISBN 1-870812–44-1.
6. Scott.R.A., “Textiles for protection”, Woodhead Publishing Limited, Cambridge, UK, 2005, ISBN 1-85573-921-6.

7. Saville.B.P, “Physical testing of textiles”, Woodhead Publishing Limited, Cambridge, UK, 1999, ISBN 1-85573-367-6.
8. Long.A.C, “Design and manufacture of Textile Composities”, Woodhead Publishing Ltd, Cambridge, UK, 2005, ISBN 1-85573-744-2.
9. Fung.W, “Coated and laminated textiles”, Woodhead Publishing Ltd, Cambridge, UK, 2002, ISBN 1-85573-576-8.
10. Anand.S.C, Kennedy.J.F, Miraftab.M and Rajendran.S., “Medical textiles and biomaterials for health care”, Woodhead Publishing Ltd, Cambridge, UK, 2006, ISBN 1-85573-683-7.
11. Fung.W and Hardcastle, “Textiles in automotive engineering”, Woodhead Publishing Ltd, Cambridge, U. K, 2001, ISBN 1-85573-493-1.
12. John.N.W.M, “Geo Textile”, Blackie and Sons Ltd, London, U.K., 1987, ISBN 0-412-013517.

TT 9354 BONDED FABRICS L T P C
3 0 0 3

UNIT I INTRODUCTION 5

Definitions and classification of bonded fabrics; fibres and their characteristics for the production of bonded fabrics, uses; production methods and consumption of non-wovens

UNIT II WEB FORMING 9

Production of staple-fibre web by dry and wet methods; web laying methods and its influence on fabric properties; manufacture of web from filaments; uniformity and quality control of web

UNIT III BONDING 13

Bonded fabric production by needling, stitching, water jet consolidation, thermal and chemical methods; production of bonded fabrics by spun bonding and melt blown process; effect of processing parameters on fabric properties

UNIT IV FINISHING 9

Dry finishing – shrinkage, wrenching and creping, calendaring, perforating, slitting and splitting; wet finishing – washing, dyeing, printing; softening, flame proofing; coating; laminating; flocking

UNIT V EVALUATION 9

Various end uses of bonded fabrics; evaluation of non-woven fabrics; structure- property relationship in bonded fabrics

TOTAL : 45 PERIODS

REFERENCES

1. Lunenschloss J., Albrecht W. and David Sharp., “Non-woven Bonded Fabrics”, Ellis Horwood Ltd, New York, 1985, ISBN: 0-85312-636-4.
2. Gulrajani M.L., “Non wovens”, Textile Institute, Manchester, 1992.
3. Mrstina V. and Feigl F., “Needle punching Textile Technology”, Elsevier, New York, 1990.
4. Dharmadhikary R.K., Gilmore T.F., Davis H.A. and Batra S.K., “Thermal bonding of nonwoven fabrics”, Textile Progress, Vol.26, No.2, Textile Institute Manchester, 1995, ISBN: 1870812786
5. Jirsak O. and Wadsworth L.C., “Non woven Textiles”, Textile Institute, Manchester, 1999, ISBN: 0 89089 9788
6. Russell S., “Hand book of nonwovens”, Textile Institute, Manchester, 2004, ISBN: 1 85573 603 9.

TT 9355 FINANCIAL MANAGEMENT FOR TEXTILE AND APPAREL INDUSTRIES

L T P C
3 0 0 3

UNIT I **5**

Costing - concepts; classification of costs; preparation of cost sheet; costing of yarn, fabric and garment

UNIT II **9**

Depreciation – method of computing depreciation; techniques of investment analysis - payback period method, accounting rate of return, DCF methods - IRR, NPV, PI

UNIT III **9**

Cost of capital; equity, debt, convertible debentures, preference share capital; capital structure; dividend policy; short, intermediate and long term financing

UNIT IV **5**

Working capital management - management of liquidity and current assets, estimation of working capital requirements for spinning mill, composite textile mill and garment unit; management of cash and marketable securities

UNIT V **17**

Tools of financial analysis and control- trading, profit and loss account, balance sheet; financial ratio analysis; funds flow analysis and financial forecasting; analysis of operating and financial leverage; illustrations for spinning mill, composite textile mill and garment industry

TOTAL : 45 PERIODS

REFERENCES

1. Pandey I. M., “Financial management”, Vikas Publishing House Pvt. Ltd., New Delhi, 8th Edition, 1999.
2. Bhave P.V. and Srinivasan V., “Costing accounting to textile mills”, ATIRA, Ahmadabad, 1976.
3. Thukaram Rao M.E., “Cost and management accounting” New Age International, Bangalore, 2004.
4. Thukaram Rao M.E., “Cost accounting and financial management” New Age International, Bangalore, 2004.
5. Prasanna Chandra, “Financial management, theory and practice, Tata McGraw-Hill Publishing Company Ltd, 5th Edition, New Delhi., 2001.
6. James C. Vanhorne, “Financial management and policy”, Pearson Education Asia (Low priced edition) 12th edition, 2002.
7. Narang, G. B. S. and Kumar V., “Production and costing”, Khanna Publishers, New Delhi, 1988.
8. Aswat Damodaran, “Corporate finance theory and practice”, John Wiley & Sons, 2000.
9. Hrishikes Bhattacharya, “Working capital management, strategies and techniques”, Prentice – Hall of India Pvt. Ltd., New Delhi, 2001.
10. Khan and Jain, “Basic financial management & practice”, Tata McGraw Hill, New Delhi, 5th edition, 2001.

TT 9356 **FABRIC MANUFACTURE LABORATORY** **L T P C**
0 0 3 2

LIST OF EXPERIMENTS

1. Study of cone / cheese winding machine
2. Analysis of Yarn faults
3. Study of warping machine
4. Analysis of sizing chemicals
5. Preparation of size paste
6. Shedding mechanisms
7. Picking mechanism in shuttle looms
8. Study of Picking mechanism in shuttleless loom
9. Beat-up mechanism
10. Let-off mechanisms
11. Take-up mechanisms
12. Weft replenishment mechanism in shuttle looms
13. Warp protector mechanism
14. Study of plain, rib and interlock circular knitting machines
15. Study of flat knitting machines

TOTAL : 45 PERIODS

TT 9357 **TECHNICAL TEXTILES LABORATORY** **L T P C**
0 0 2 1

LIST OF EXPERIMENTS

1. Creep study on i) high performance fibres and yarns and ii) technical fabrics
2. Fatigue failure measurement on high performance fibres and yarns
3. Preparation of coated fabrics
4. Evaluation of coated fabric
5. Preparation of textile reinforced composites
6. Evaluation of textile reinforced composites
7. Analysis of non woven fabrics
8. Quality evaluation of tyre-cord fabric
9. Study of construction details of V belts
10. Preparation of fire-retardant fabrics
11. Evaluation of fire-retardant fabric
12. Preparation of water-proof fabrics
13. Evaluation of water-proof fabric

TOTAL : 45 PERIODS

TT 9358 TEXTILE QUALITY EVALUATION LABORATORY L T P C
0 0 3 2

LIST OF EXPERIMENTS

1. Determination of fibre fineness, length and maturity
2. Determination of single and bundle yarn strength and count
3. Determination of yarn twist
4. Determination of yarn crimp
5. Determination of evenness of sliver roving and yarn
6. Determination of seam strength
7. Determination of fabric tensile strength
8. Determination of air permeability
9. Determination of fabric bursting strength
10. Determination of fabric drape
11. Determination of fabric crease recovery and wrinkle recovery
12. Determination of fabric abrasion resistance and pilling
13. Determination of fabric colour fastness (light, rubbing, washing and perspiration)
14. Assessment of fabric faults
15. Assessment of garment faults

TOTAL : 45 PERIODS

GE 9371 COMMUNICATION SKILLS AND SOFT SKILLS LABORATORY L T P C
0 0 2 1

AIM

To enhance the overall capability of students and to equip them with the necessary Communication Skills and Soft Skills that would help them excel in their profession.

OBJECTIVES

- To equip students of engineering and technology with effective speaking and listening skills in English.
- To help them develop their soft skills and interpersonal skills, which will make the transition from college to workplace smoother and help them excel in their job.
- To enhance the performance of students at Placement Interviews, Group Discussions and other recruitment exercises.

1. PC based session

A. Career Lab (15 periods) Viewing and discussing audio-visual materials

1. **Resume / Report Preparation / Letter Writing:** (3)
   Letter writing – Job application with Resume - Project report - Email etiquette.

2. **Presentation skills:** (3)
   Elements of effective presentation – Structure of presentation - Presentation tools – Body language.

3. **Soft Skills:** (3)
   Time management – Stress management – Assertiveness – Negotiation strategies, Psychometrics - Analytical and logical reasoning.

4. **Group Discussion:** (3)
   Group discussion as part of selection process, Structure of group discussion – Strategies in group discussion – Mock group discussions.
5. **Interview Skills:** (3)
   Kinds of interviews – Interview techniques – Corporate culture – Mock interviews.

TOTAL :45 PERIODS

II. Class Room Session

1. **Resume / Report Preparation / Letter writing**: Students prepare their own resume and report. (9)
2. **Presentation Skills:** Students make presentations on given topics. (12)
3. **Group Discussion**: Students participate in group discussions. (12)
4. **Interview Skills**: Students participate in Mock Interviews (12)

   Note: Classroom sessions are practice sessions.

REFERENCES

1. Prakash P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd., 2nd Edition, New Delhi, 2004.
2. John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University Press, New Delhi 2004.
3. Paul V Anderson, **Technical Communication**, Thomson Wadsworth , 6th Edition, New Delhi, 2007.
4. Edgar Thorpe and Showick Thorpe, **Objective English**, Pearson Education, 2nd Edition, New Delhi 2007.
5. David Evans, **Decision maker**, CUP, 1997

LAB REQUIREMENT

1. Teacher console and systems for students.
2. English Language Lab Software
3. Tape recorders

TT 9401 TOTAL QUALITY MANAGEMENT FOR TEXTILE AND APPAREL INDUSTRIES

L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Definition of quality, dimensions of quality, quality planning, quality costs – analysis techniques for quality costs; basic concepts of total quality management, historical review; principles of TQM; leadership – concepts, role of senior management; quality council, quality statements; strategic planning; Deming philosophy; barriers to TQM implementation

UNIT II TQM PRINCIPLES 13

Customer satisfaction – customer perception of quality, customer complaints, service quality, customer retention; employee involvement – motivation, empowerment, teams, recognition and reward; performance appraisal, benefits; continuous process improvement – Juran trilogy, PDSA cycle, 5S, Kaizen; supplier partnership – partnering, sourcing, supplier selection, supplier rating, relationship development; performance measures – basic concepts, strategy, performance measure

UNIT III STATISTICAL PROCESS CONTROL (SPC) 9

Seven tools of quality; statistical fundamentals – measures of central tendency and dispersion, population and sample, normal curve; control charts for variables and attributes; process capability, concept of six sigma; new seven management tools; SPC applied to textile industry

UNIT IV TQM TOOLS 9

Benchmarking – reasons to benchmark, benchmarking process; Quality Function Deployment (QFD) – House of quality, QFD process, benefits; Taguchi quality loss function; Total Productive Maintenance (TPM) – concept, improvement needs, FMEA – stages of FMEA; TQM tools application in textile industry

UNIT V QUALITY SYSTEMS 5

Need for ISO 9000 and other quality systems; ISO 9000:2000 quality system – elements, implementation of quality system, documentation, quality auditing; QS 9000, ISO 14000 – concept, requirements and benefits; quality systems implementation in spinning, weaving and garment industry

TOTAL : 45 PERIODS

REFERENCES

1. James R.Evans and William M.Lidsay., "The Management and Control of Quality", (5th Edition), South-Western (Thomson Learning), 2002, ISBN 0-324-06680-5.
2. Dale H. Besterfiled. et at., "Total Quality Management", Pearson Education Asia, 1999, Indian reprint -2002
3. Feigenbaum A.V., "Total Quality Management", McGraw-Hill, 1991.
4. Oakland J.S., "Total Quality Management", Butterworth, Oxford. 1989.
5. Narayana V., and Sreenivasan N.S., "Quality Management – Concepts and Tasks", New Age International, 1996.
6. Zeiri., "Total Quality Management for Engineers", Woodhead Publishers, 1991.

GE 9261 ENVIRONMENTAL SCIENCE AND ENGINEERING L T P C
3 0 0 3

AIM

To create awareness in every engineering graduate about the importance of environment, the effect of technology on the environment and ecological balance and make them sensitive to the environment problems in every professional endeavour that they participates.

OBJECTIVE

- At the end of this course the student is expected to understand what constitutes the environment, what are precious resources in the environment, how to conserve these resources, what is the role of a human being in maintaining a clean environment and useful environment for the future generations and how to maintain ecological balance and preserve bio-diversity. The role of government and non-government organization in environment managements.

UNIT I ENVIRONMENT, ECOSYSTEMS AND BIODIVERSITY 14

Definition, scope and importance of environment – need for public awareness - concept of an ecosystem – structure and function of an ecosystem – producers, consumers and decomposers – energy flow in the ecosystem – ecological succession – food chains, food webs and ecological pyramids – Introduction, types, characteristic features, structure and function of the (a) forest

ecosystem (b) grassland ecosystem (c) desert ecosystem (d) aquatic ecosystems (ponds, streams, lakes, rivers, oceans, estuaries) – Introduction to biodiversity definition: genetic, species and ecosystem diversity – biogeographical classification of India – value of biodiversity: consumptive use, productive use, social, ethical, aesthetic and option values – Biodiversity at global, national and local levels – India as a mega-diversity nation – hot-spots of biodiversity – threats to biodiversity: habitat loss, poaching of wildlife, man-wildlife conflicts – endangered and endemic species of India – conservation of biodiversity: In-situ and ex-situ conservation of biodiversity.

Field study of common plants, insects, birds

Field study of simple ecosystems – pond, river, hill slopes, etc.

UNIT II ENVIRONMENTAL POLLUTION 8

Definition – causes, effects and control measures of: (a) Air pollution (b) Water pollution (c) Soil pollution (d) Marine pollution (e) Noise pollution (f) Thermal pollution (g) Nuclear hazards – soil waste management: causes, effects and control measures of municipal solid wastes – role of an individual in prevention of pollution – pollution case studies – disaster management: floods, earthquake, cyclone and landslides.

Field study of local polluted site – Urban / Rural / Industrial / Agricultural.

UNIT III NATURAL RESOURCES 10

Forest resources: Use and over-exploitation, deforestation, case studies- timber extraction, mining, dams and their effects on forests and tribal people – Water resources: Use and over-utilization of surface and ground water, floods, drought, conflicts over water, dams-benefits and problems – Mineral resources: Use and exploitation, environmental effects of extracting and using mineral resources, case studies – Food resources: World food problems, changes caused by agriculture and overgrazing, effects of modern agriculture, fertilizer-pesticide problems, water logging, salinity, case studies – Energy resources: Growing energy needs, renewable and non renewable energy sources, use of alternate energy sources. case studies – Land resources: Land as a resource, land degradation, man induced landslides, soil erosion and desertification – role of an individual in conservation of natural resources – Equitable use of resources for sustainable lifestyles.

Field study of local area to document environmental assets – river / forest / grassland / hill / mountain.

UNIT IV SOCIAL ISSUES AND THE ENVIRONMENT 7

From unsustainable to sustainable development – urban problems related to energy – water conservation, rain water harvesting, watershed management – resettlement and rehabilitation of people; its problems and concerns, case studies – role of non-governmental organization-environmental ethics: Issues and possible solutions – climate change, global warming, acid rain, ozone layer depletion, nuclear accidents and holocaust, case studies. – wasteland reclamation – consumerism and waste products – environment production act – Air (Prevention and Control of Pollution) act – Water (Prevention and control of Pollution) act – Wildlife protection act – Forest conservation act – enforcement machinery involved in environmental legislation- central and state pollution control boards- Public awareness.

UNIT V HUMAN POPULATION AND THE ENVIRONMENT 6

Population growth, variation among nations – population explosion – family welfare programme – environment and human health – human rights – value education – HIV / AIDS – women and child welfare – role of information technology in environment and human health – Case studies.

TOTAL: 45 PERIODS

TEXT BOOKS

1. Gilbert M.Masters, "Introduction to Environmental Engineering and Science", 2nd edition, Pearson Education (2004).
2. Benny Joseph, "Environmental Science and Engineering", Tata McGraw-Hill, New Delhi, (2006).

REFERENCES

1. R.K. Trivedi, "Handbook of Environmental Laws, Rules, Guidelines, Compliances and Standards", Vol. I and II, Enviro Media.
2. Cunningham, W.P. Cooper, T.H. Gorhani, "Environmental Encyclopedia", Jaico Publ., House, Mumbai, 2001.
3. Dharmendra S. Sengar, "Environmental law", Prentice hall of India PVT LTD, New Delhi,2007.
4. Rajagopalan, R, "Environmental Studies-From Crisis to Cure", Oxford University Press (2005)

TT 9402 GARMENT TECHNOLOGY L T P C
4 0 0 4

UNIT I GARMENT PRODUCTION 12

Anthropometry, mass-production, mass-customization; pattern making, grading, marker planning, spreading & cutting

UNIT II SEAMS AND STITCHES 18

Different types of seams and stitches; sewing machine - mechanism and accessories; needle – functions, special needles, needle size, numbering, needlepoint; sewing thread-construction, material, thread size, packages.

UNIT III COMPONENTS AND TRIMS 6

Labels, linings, interlinings, wadding, lace, braid, elastic, hook and loop fastening, shoulder pads, eyelets and laces, zip fasteners, buttons

UNIT IV TESTING AND PRODUCT EVALUATION 18

Raw material, in process and final inspection; needle cutting; sewability of fabrics; strength properties of apparel; dimensional changes in apparel due to laundering, dry-cleaning, steaming and pressing; care labeling of apparel

UNIT V PRESSING AND GARMENT PROCESSING 6

Garment dyeing, printing and finishing; pressing categories and equipment

L : 45 , T : 15 , TOTAL : 60 PERIODS

REFERENCES

1. Carr H., and Latham B., "The Technology of Clothing Manufacture", Blackwell Science Ltd., Oxford, 1994, ISDN: 0632037482.
2. Winifred Aldrich., "Metric Pattern Cutting", Blackwell Science Ltd., Oxford, 1994.
3. Peggal H., "The Complete Dress Maker", Marshall Caverdish, London, 1985.
4. Gerry Cooklin., "Introduction to Clothing Manufacture", Blackwell Scientific Publications, London, 1991, ISDN: 0-632-02661-8.
5. Jai Prakash and Gaur R.K., "Sewing Thread", NITRA, 1994.
6. Ruth Glock, Grace I. Kunz, "Apparel Manufacturing", New Jersey, 1995, ISDN: 0-02-344142-9.
7. Pradip V.Mehta, "An Introduction to Quality Control for the Apparel Industry", 1992.

TT 9403 MECHANICS OF TEXTILE MACHINERY L T P C
3 0 0 3

UNIT I MACHINE DESIGN 14

Equations of forces, motion and energy; design of cams; gear trains and draft calculations; principles of clutches and brakes - practical application in textile machines

UNIT II ROTARY MOTION 13

Equations of rotary motion; energy stored in rotating masses; power transmitted by rope and belt drives; friction calculations; balancing of rotating masses

UNIT III SPINNING MACHINERY 9

Differentials and variable speed drives – principles, application in textile machines; design of cone drums – piano feed regulation, speed frame builder mechanism; balloon and traveler dynamics

UNIT IV WEAVING MACHINERY 9

Design of winder drums; kinematics of shedding; picking – cams, torsion bars and other mechanisms; beat up; back rest

TOTAL : 45 PERIODS

REFERENCES

1. Booth J. E., “Textile Mathematics”, Vol.2&3, The Textile Institute, Manchester, 1975, ISBN-10: 0900739193.
2. Slater K., “Textile Mechanics”, Vol. 1&2, The Textile Institute, Manchester, 1977, ISBN: 0900739274.
3. Rengasamy R. S., “Mechanics of spinning machines”, NCUTE, Ministry of Textiles, Govt of India, 2000.

TT 9404 CLOTHING SCIENCE L T P C
3 0 0 3

UNIT I FABRIC APPEARANCE 9

Fibre structure, yarn structure and fabric construction; their effect on fabric appearance; study of properties such as pilling, fastness, and lustre

UNIT II COMFORT 9

Effect of fibre properties, yarn structure and fabric construction on the fabric properties – drapeability, air permeability, moisture absorption, bending rigidity, shear

UNIT III DURABILITY 9

Study of tensile, tearing strength, bursting strength with respect to fibre properties, yarn structure and fabric design

UNIT IV FABRIC AS PROTECTION 4

Study of protective properties of apparel for various applications; desirable properties of protective textiles; method of testing for thermal protective performance, impact, abrasion and wear resistance; evaluation of resistance to mildew, ageing, sunlight, chemical, static electricity and flame propagation; ASTM standards for protective garments

UNIT V EASY CARE 5

Crease resistance, anti-shrink, pilling resistance behaviour – role of fibre properties and chemical treatments

UNIT VI FABRIC ENGINEERING 9

Fabric engineering for a given end use - selection of fibre, type of yarn, fabric structure and finishing treatments

TOTAL : 45 PERIODS

REFERENCES

1. Morton W.E., and Hearle J.W.S., "Physical Properties of Textile Fibers", The Textile Institute, Manchester, 1993.
2. Hearle J.W.S., Grosberg P. and Baker S., "Structural mechanics of Fibres yarn and Fabrics", Vol .1, Wiley-Intersciences, New York, 1969.
3. Meridith R., "Mechanical Properties of Textiles Fibres", Interscience, New York, 1986.
4. Goswami B.C., Martindale J. and Scandino F.L., "Textiles Yarns; Technology, Structure and Applications", Wiley Interscience, New York, 1997.
5. Shenai V.A., "Textiles finishing", Sevak publications, Bombay, 1989.

TT 9407 TEXTILE CHEMICAL PROCESSING LABORATORY L T P C
0 0 3 2

LIST OF EXPERMENTS

1. Acid and enzymatic desizing of cotton grey fabrics
2. Sodium Hypochlorite and Hydrogen peroxide bleaching of cotton fabrics
3. Degumming of silk
4. Dyeing of cotton with direct dyes.
5. Dyeing of cotton with reactive dyes.
6. Dyeing of polyester with disperse dyes.
7. Dyeing of P/C blends with reactive/disperse dyes.
8. Crease Proofing of cotton using free formaldehyde resins.
9. Studies on shrinkage of fabrics
10. Determination of Yellowness, Whiteness Indices of grey and bleached fabrics.
11. Determination of absorbance of dye solution ad K/S value of dyed fabrics.
12. Determination of washing, rubbing, perspiration and light fastness ratings
13. Printing with pigments.
14. Identification of fibre and blend analysis
15. Identification of dyes.

TOTAL : 45 PERIODS

TT 9408 INDUSTRIAL TRAINING L T P C
0 0 0 1

Each student should undergo implant training in textile/apparel industry for four weeks, two weeks each at the end of IV semester and VI semester. Students have to submit a report before the VII semester examination. Faculty in-charge will evaluate the report and award credits.

TT 9451 **PROJECT WORK** **L T P C**
0 0 12 6

Each student is required to submit a report on the project assigned to him by the Department. The report should be based on the information available in the literature or data generated in the laboratory/industry. The object of the project is to make use of the knowledge gained by the student at the various stages of the degree programme. This helps to judge the level of proficiency, originality and capacity for application of knowledge attained by the students by the end of the programme.

GE9023 **FUNDAMENTALS OF NANOSCIENCE** **L T P C**
3 0 0 3

AIM

To make the students understand the importance , relevance and potentialities of this emerging field of study.

OBJECTIVES

- Study the basic nano technology and nano science.
- Understand interdisciplinary nature of this field.
- Understand the importance role of physics, chemistry, biology.
- Recognize that the rules of nano science are fundamentally different than those we experience.
- Study the basic fabrication strategies of nano science.

UNIT I INTRODUCTION **10**

Nanoscale Science and Technology- Implications for Physics, Chemistry, Biology and Engineering-Classifications of nanostructured materials- nano particles- quantum dots, nanowires-ultra-thinfilms-multilayered materials. Length Scales involved and effect on properties: Mechanical, Electronic, Optical, Magnetic and Thermal properties. Introduction to properties and motivation for study (qualitative only).

UNIT II PREPARATION METHODS **10**

Bottom-up Synthesis-Top-down Approach: Precipitation, Mechanical Milling, Colloidal routes, Self-assembly, Vapour phase deposition, MOCVD, Sputtering, Evaporation, Molecular Beam Epitaxy, Atomic Layer Epitaxy, MOMBE.

UNIT III PATTERNING AND LITHOGRAPHY FOR NANOSCALE DEVICES **5**

Introduction to optical/UV electron beam and X-ray Lithography systems and processes, Wet etching, dry (Plasma /reactive ion) etching, Etch resists-dip pen lithography

UNIT IV PREPARATION ENVIRONMENTS **10**

Clean rooms: specifications and design, air and water purity, requirements for particular processes, Vibration free environments: Services and facilities required. Working practices, sample cleaning, Chemical purification, chemical and biological contamination, Safety issues, flammable and toxic hazards, biohazards.

UNIT V CHARECTERISATION TECHNIQUES 10

X-ray diffraction technique, Scanning Electron Microscopy - environmental techniques, Transmission Electron Microscopy including high-resolution imaging, Surface Analysis techniques- AFM, SPM, STM, SNOM, ESCA, SIMS-Nanoindentation

TOTAL : 45 PERIODS

TEXT BOOKS

1. A.S. Edelstein and R.C. Cammearata, eds., "Nanomaterials: Synthesis, Properties and Applications", Institute of Physics Publishing, Bristol and Philadelphia, 1996.
2. N John Dinardo, "Nanoscale charecterisation of surfaces & Interfaces", 2nd Edition, Weinheim Cambridge, Wiley-VCH, 2000

REFERENCES

1. G Timp (Editor), "Nanotechnology", AIP press/Springer, 1999
2. Akhlesh Lakhtakia (Editor), "The Hand Book of Nano Technology,Nanometer Structure", Theory, Modeling and Simulations", Prentice-Hall of India (P) Ltd, New Delhi, 2007.

TT 9021 FIBRE AND TEXTILE COMPOSITES L T P C
3 0 0 3

UNIT I INTRODUCTION AND THEORY 9

Chemistry and development of resins, resin additives and their effects; reinforcements; properties of composite materials; comparison of structural materials

UNIT II CONSTRUCTION OF COMPOSITE STRUCTURES 9

Techniques for manufacturing composites – open and closed moulds and continuous processes; preparation of reinforcing structures - 3D woven and knits; curing - chemical and temperature effects; fiber volume fraction

UNIT III PROPERTIES AND BEHAVIOR OF COMPOSITES 9

Behavior of composites under stress, anisotropy of stress; elasticity-thermal and electrical conductivity; fatigue resistance; effect of manufacturing settings, chemicals and materials on the properties of composites

UNIT IV QUALITY CONTROL 9

Quality control in raw materials, material selections/preparation, mould preparation; operation control in manufacturing and curing; control of finished products

UNIT V REINFORCING FIBERS 9

Chemistry and manufacture of high performance filaments – kevlar, high performance polyethylene, glass, carbon; end uses with composite structures reinforced with reinforcing fibres

TOTAL : 45 PERIODS

REFERENCES

1. Pipes R. B., "Composite Materials", Vol. 1, 2 & 3, Elsevier Science Publishers, New York, 1990.
2. Ashbee K. H. G., "Fundamental principles of fiber reinforced composites", CRC Press, 1993, ISBN 0877629234.
3. Hearl J. W. S., "Physical properties of Textile Fibres", The Textile Institute, Manchester. 1997.

TT 9022 TEXTURED YARN TECHNOLOGY L T P C
3 0 0 3

UNIT I INTRODUCTION 9

Need for bulking of synthetic yarns; texturability of fibres, classifications and principles of methods of texturing

UNIT II HEAT SETTING 9

Heat setting – need, types of setting, factors involved; effect on fibre morphology and yarn properties; evaluation of heat setting processes

UNIT III FALSE TWIST TEXTURING 9

Draw texturing - simultaneous and sequential draw texturing; twisting devices; heating and cooling systems; take-up systems; characteristics of feed yarns; process parameters-time, temperature, twist, tension; evaluation of false-twist textured yarns; end-uses.

UNIT IV AIR JET TEXTURING 9

Types of yarns produced; airflow pattern in different types of nozzles; loop formation-mechanism, factors involved; evaluation of air-jet textured yarn; comparison of air-jet textures yarn with spun and false twist textured yarns; end-uses

UNIT V OTHER METHODS OF TEXTURING 9

Stuffer box, edge crimping, knit-de-knit and gear crimping methods; bi-component filament texturing; differential shrinkage texturing; chemo - mechanical texturing; limitations and applications

TOTAL: 45 PERIODS

REFERENCES

1. Hes L. and Ursiny P., "Yarn Texturing Technology ", Eurotex, U.K. 1994.
2. Ali Demir and Hassan M. Behery., "Synthetic filament yarn texturing technology", Prentice Hall, 1996, ISBN: 0134400259.
3. Gulrajani M. L. (Ed.), “Annual symposium of texturing”, I.I.T Delhi, 1977.
4. Wilson D. K. and Kollu T., "Production of textured yarns by the false twist technique", Textile progress Vol. 21, No.3, Textile Institute, Manchester, U.K., 1991.
5. Wilson D. K. and Kollu T., "Production of textured yarns by methods other than false twist technique", TP Vol.16, No.3, Textile Institute, 1981.
6. Hearl J.W.S., Hollick L. and Wilson D.K., “ Yarn texturing Technology”, Woodhead Publication Ltd., 2001 ISBN: 185573575X

TT9023 SILK YARN TECHNOLOGY L T P C
3 0 0 3

UNIT I REARING 5

Domestic silk worm rearing – multivoltine, bivoltine and univoltine species; wild silk worms rearing – Tasar, Muga and Eri culture

UNIT II SILK REELING 13

Cocoon quality; stifling and conditioning of cocoons, boiling and brushing of cocoons; reeling; re-reeling; raw silk testing and classification; wild silk reeling; production of spun silk yarn

UNIT III SILK WEAVING 9

Technological parameters of weaving and productivity; weaving of silk fabrics using semi automatic, automatic, shuttleless and pile looms

UNIT IV PREPARATION OF SILK 9

Properties of sericin; deguming of silk - extraction with water, treatment with alkalis and digestion with enzymes; bleaching of silk – origin and nature of colours, bleaching with reducing and oxidising agents

UNIT V DYEING, PRINTING AND FINISHING 9

Dyeing with acid, basic and reactive dyes; different styles of printing with acid and reactive dyes, printing with pigments, khadi and metallic powders, sublimation transfer printing; finishing of silk – weighting, softening, flame proofing, crease proofing, mildew proofing

TOTAL: 45 PERIODS

REFERENCES

1. "Manuals on Sericulture", Food and agriculture organisation of the United Nations, Rome, 1976.
2. "Silk dyeing and finishing handbook", compiled by Shanghai Municipality Silk Industry Corporation, China, 2000, ISBN :1578080886.
3. "Silk weaving", compiled by Zhejiang silk engineering institute, China, Suzhou silk engineering institute, China, Oxford & IBH Publishing company pvt. Ltd, New Delhi, 2002.
4. Gulrajani M.L., (ed.) "Silk – dyeing printing and finishing", Indian Institute of Technology, New Delhi, 1989.
5. Nanavathy M., "Silk production, processing and marketing", Wiley Eastern, 1991.
6. Scott P., "The book of silk", Thames and Hudson, 1993.
7. Sinha S., "The development of Indian silk: A wealth of opportunities", Intermediate technology, U.K, 1990.
8. Rheinberg L., "The romance of silk", Textile progress, The Textile institute, Manchester, 1991.
9. Sonwalker T.A., "Handbook of silk technology", Wiley Eastern, Chennai, 1992.
10. Shekar P. and Ardingham., "Sericulture and silk production – A hand book", Intermediate Technology, U.K., 1995, ISBN:1853393177.
11. Dandin S.B., Jayaswal J. and Giridhar K. (ed.), "Handbook of Sericulture Technologies", Central Silk Board, Bangalore, 2003.
12. Huang Guo Rui (ed.), "Silk reeling", Oxford & IBH Publishing company Pvt. Ltd., New Delhi, 1998.

TT 9024 NEW SPINNING TECHNOLOGIES L T P C

3 0 0 3

UNIT I CONDENSED YARN SPINNING 5

Principle of condensed yarn spinning; working of different methods of condensed yarn spinning; advantages of this method over conventional ring spinning method.

UNIT II ROTOR SPINNING 13

Description of the working of the rotor spinning; requirements of the raw materials; preparation of the sliver for rotor spinning; yarn formation and its structure; yarn withdrawal and winding; rotor design and its implications on production and yarn quality; production limits; comparison with ring spinning.

UNIT III FRICTION SPINNING 9

Detailed study of the DREF-2, DREF-3 and master spinner machines working on the principles of friction spinning; the use of raw materials; application of these machines for different end products; the economics; technological limitations.

UNIT IV AIR-JET SPINNING 9

Description of the yarn production in air jet spinning machine; feasibility of higher draft applied in this machine; structure and quality of the air-jet spun yarn; raw materials requirement.

UNIT V OTHER SPINNING TECHNOLOGIES 9

Production of yarn in PLY fil spinning, process applying similar principle; comparison with other spinning methods; working details of the production of double-rove yarns and wrap yarns; use of raw materials; economics of these methods of yarn production; yarn characteristics and their application. .

TOTAL : 45 PERIODS

REFERENCES

1. Oxtoby E., " Spun Yarn Technology ", Butterworths, London, 1987.
2. Klein W., " New Spinning Methods ", The Textile Institute, Manchester, 1993.
3. Dyson E., " Rotor Spinning, Technical and Economics Aspects ", Textile Trade Press, New Mills, Stock Port, 1975.
4. Salhotra K.R. and Ishtiaque S.M., " Rotor Spinning; its advantages ", Limitations and Prospects in India, ATIRA, Ahmedabad, 1995.
5. Lord P.R, " Yarn Production; Science, Technology and Economics ", The Textile Institute, Manchester, 1999.
6. Trommer G., " Rotor Spinning", Meliand Textilebenchte GmbH, Rohrbacher, 1995.
7. Lawerence C.A and Chen K.Z., " Rotor Spinning ", Textile Progress, The Textile Institute, Manchester, 1984.

TT 9025 THEORY OF YARN SPINNING L T P C

3 0 0 3

UNIT I FIBRE DISPERSION 9

Ginning of cotton; the necessity of fibre-individualization; fibre opening in blow-room machinery; the mechanism of fibre-dispersion during carding operation; the minimum requirements during carding and the new approaches to improve fibre-dispersion in carding operation; neps formation and removal; theory of hook formation.

UNIT II ATTENUATION AND FIBRE STRAIGHTENING 13

Principle of roller drafting and its application in yarn production; drafting irregularities – their causes and remedies; the function of aprons in roller drafting; limitation of apron-drafting and the scope for improvement; mechanism of wire-point drafting and its application in yarn production; merits and demerits of wire-point drafting; comparison of wire-point drafting with roller drafting; definition of fibre-extent; influence of fibre-extent on yarn quality; improvement of fibre-extent by straightening actions in carding, drafting and combing.

UNIT III TWISTING 9

Effect of twisting of staple-fibre strand on its strength; meaning of twist multiplier and the basis of selection of required twist; fundamental requirement to create real twist in a strand; mechanism of different twisting principles – ring-twisting, open-end twisting, air-jet twisting, up-twisting, two-for-one twisting, hollow-spindle twisting.

UNIT IV FIBRE BLENDING AND LEVELLING 9

Importance of fibre-mix homogeneity on yarn quality; types of mixing during spinning preparatory process; assessment of blend efficiency; influence of intermediate product uniformity on yarn uniformity; methods of leveling adopted during spinning processes.

UNIT V FIBRE CLEANING 5

Methods adopted to clean the fibres from trash, short fibres and neps; role of blow-room, card and comber in fibre cleaning.

TOTAL : 45 PERIODS

REFERENCES

1. Oxtoby E., "Spun Yarn Technology", Butterworths, London, 1987.
2. Klein W., "The Technology of Short-staple Spinning", The Textile Institute, Manchester, 1998. ISBN: 1870812980.
3. Klein W., "A Practical Guide to Opening and Carding", The Textile Institute, Manchester, 1999. ISBN: 1870812999.
4. Klein W., "A Practical Guide to Combing, Drawing and the Roving Frame", The Textile Institute, Manchester, 1999. ISBN: 1870372287.
5. Klein W., "A Practical Guide to Ring Spinning", The Textile Institute, Manchester, 1999. ISBN: 1870372298.
6. Lord P.R., "Yarn Production: Science, Technology and Economics", The Textile Institute, Manchester, 1999. ISBN: 1870372174.
7. Salhotra K.R. and Chattopadhyay R., "Book of papers on Blow-room, Card", Indian Institute of Technology, Delhi, 1998.
8. Shaw J., "Short-staple Ring Spinning", Textile Progress, The Textile Institute, Manchester, 1982.
9. Doraiswamy I., Chellamani P., and Pavendhan A., "Cotton Ginning", Textile Progress, Vol. 24, No.2, The Textile Institute, Manchester, 1993. ISBN: 1870812484.
10. Grosberg P. and Iyre C., "Yarn Production: Theoretical Aspects", Textile Institute, 1999, ISBN: 1870372034.

TT 9026 LONG STAPLE FIBRE SPINNING TECHNOLOGY L T P C
3 0 0 3

UNIT I FIBRE CLEANING AND BLENDING 5

Impurities in the long-staple fibre like wool and their removal; methods adopted to process raw flax and jute; blending methods followed for long stable fibres

UNIT II FIBRE INDIVIDUALISATION 9

Fibre individualization in the carding machine; working principle and details of different type of carding machine-worsted carding, semi -worsted carding, woolen carding, flax carding and jute carding; card clothing and its maintenance; carding performance

UNIT III COMBING 9

Objective of combing; basic principles of combing; details of wool combing preparation and combing operation; worsted top finishing

UNIT IV DRAWING 9

Principle of long-staple drafting; effect of doubling; drafting irregularities; working details of worsted, semi worsted, jute and flax drawing; operating principle of roving machine

UNIT V YARN SPINNING 13

Mule spinning -drafting, twisting, backing-off, winding on; description of centrifugal spinning; flyer spinning; ring spinning - twisting, rings and travellers; condenser yarn spinning; cap spinning; open end spinning –general features of rotor and friction spinning as applicable to long-stable fibres; double-rove spinning; self twist spinning system

TOTAL: 45 PERIODS

REFERENCES

1. Oxtoby E., "Spun Yarn Technology", Butterworths, London, 1987.
2. Happey F., "Contemporary Textile Engineering", Academic Press, London, 1983.
3. Lord P.R., "Yarn Production: Science, Technology and Economics", The Textile Institute, Manchester, 1999.
4. Ross D.A., Carnaby G.A and Lappage J., "Woollen Yarn Manufacture", Textile Progress, The Textile Institute, Manchester, 1986.
5. Richards R.T.D. and Sykes A.B., "Woollen Yarn Manufacture", The Textile Institute, Manchester, 1994.
6. Henshaw D.E., "Worsted Spinning", Textile Progress, The Textile Institute, Manchester, 1981.

TT 9027 PROCESS CONTROL IN MAN-MADE FIBRE YARN PRODUCTION L T P C

3 0 0 3

UNIT I **13**

Polyester, viscose, acrylic, lyocell fibres – fibre characteristics and effects on yarn spinning performance; objectives of blending, measures of blending, selection of blend ratio; different mechanics of blending; effect of fibre properties and blend composition on yarn properties

UNIT II **5**

Processing of manmade fibres in short staple system; tinting; RH and temperature control at preparatory and spinning; generation of static electricity and its influence on spinning processing; control of static generation

UNIT III **9**

Blending at blow room; blow room – conditioning, opening, speeds and settings, process related problems and remedies; carding – selection of wires, speeds and settings, neps removal and process related problems and remedies

UNIT IV **9**

Blending at draw frame; number of passages; calculations of number of doubling and sliver linear density for each component; roller lapping – causes and remedies; speed frame – process parameters, process related problems and remedies

UNIT V **9**

Ring frame – process parameters, process related problems and remedies; yarn faults; rotor spinning – selection of fibres, material preparation, machine and process parameters; spinning of dyed fibres – process related problems and remedies

TOTAL: 45 PERIODS

REFERENCES

1. Klein W., "Man-made fibres and their processing", The Textile Institute, Manchester, 1994.
2. Salhotra K.R., "Spinning of manmades and blends on cotton system", The Textile Association India, Bombay, 1983.
3. Garde A.R. and Subramaniam T.A., "Process control in spinning", ATIRA Publications, Ahmedabad, 1989.

TT 9028 MECHANICS OF TEXTILE STRUCTURES L T P C
3 0 0 3

UNIT I YARN GEOMETRY 13

Idealized helical yarn structure; yarn count and twist factors, twist contraction; packing of fibers in yarns; measurement of packing density and radial packing density of yarn; measurement of yarn diameter; ideal migration, tracer fiber technique, characterization of migration behavior, migration in blended yarns, mechanisms of migration, effect of various parameters on migration behavior.

UNIT II MECHANICS OF CONTINUOUS FILAMENT YARNS 9

Analysis of tensile behavior; prediction of breakage; analysis of yarn mechanics by energy method; observed extension and breakage of continuous filament yarns; mechanics of torque in filament yarns

UNIT III MECHANICS OF STAPLE FIBRE YARNS 5

Theoretical analysis; fiber obliquity and slippage; influence of fiber length, fineness and friction; strength of blended yarns - Hamburger's model

UNIT IV WOVEN FABRIC GEOMETRY AND DEFORMATION 13

Elements of woven fabric geometry; Pierce and Olofsson models - form factor; jamming of threads, cover factor; crimp interchange, degree of set; modification to Pierce model - race track, saw tooth and bilinear models, extension behavior of woven fabric; prediction of modulus, tensile properties in bias direction; other fabric deformation - shear, buckling, bending and compression; fabric handle

UNIT V NONWOVEN AND KNITTED STRUCTURES 5

Geometry of plain knitted structure, mechanics of non-woven fabrics

TOTAL : 45 PERIODS

REFERENCES

1. Hearl J. W. S., “Structural Mechanics of Fibers, Yarns and Fabrics”, Wiley-Interscience, New York, 1969, ISBN: 0471366692.
2. Hearle J. W. S., John J., Thwaites. and Jafargholi Amirbayat., “Mechanics of Flexible Fibre Assemblies”, Sijthoff and Noordhoff, 1980, ISBN : 902860720X.
3. Goswami B. C., “Textile Yarns: Technology, Structure and Applications”, Wiley-Interscience – New York, 1977, ISBN: 0471319007.
4. Jinlian Hu., “Structure and Mechanics of Woven Fabrics”, Woodhead Publishing Ltd., 2004, ISBN: 1855739046.
5. Hassan M. Berery., “Effect of Mechanical and Physical properties on Fabrics Hand”, Woodhead publishing Ltd., 2005, ISBN : 13: 978 – 1- 85573 -9185.

TT 9029 WARP KNITTING TECHNOLOGY L T P C
3 0 0 3

UNIT I **5**

Introduction to wrap knitting; warp knitted loop structures; comparison of weft and warp knitted loop structures; elements of warp knitted loop – courses and wales, open loop, closed loop; warp knitting elements- timing of knitting elements, principles of chain link motion, designation of chain links for simple patterns and chain notations, pattern disc, guide bar movement mechanism, needle bar movement mechanism, sinker bar movement mechanism

UNIT II **13**

Two bar, three bar fabrics – chain notation and quality particulars, Tricot pattern fabrics using partially threaded warp threads; Atlas lapping and their derivatives; inlayed lappings, pleated structures; requirements of machine element and lapping sequence; patterns produced using pile sinker devices; Terry pile fabric production – machine element requirement and lapping sequences; cut pile fabrics and machines used for cut pile; use of spandex fibre in tricot warp knitted patterns; electronic guide bar control use in tricot warp knitting machine and it advantages over conventional chain link system

UNIT III **13**

Principles of Raschel warp knitting, elements of Raschel machine, timing of knitting elements; simple Raschel structures, main emphasis on net structures, lapping diagram and chain notations; different types of guides used in Raschel knitting machine; Multi bar Raschel technology – principles, development of figuring, type of basic structures used in multi bar patterns; fixing of guide fingers based on the lay out of design grouping of guide bars; setting the shog rows for multi bar patterns; principle involved in summery aggregate patterning mechanism used in multi bar technology; use of string bar control systems in multi bar machines; production of power net using Raschel knitting machine; uses of fabrics produced using multibar warp knitting machines

UNIT IV **5**

Positive let off system; mechanical and electronic let off system; run in value based on the lapping diagram; take up system; mechanical and electronic take up mechanism; threading procedure in warp knitting; warping procedure and production calculation; scheduling; theoretical concepts of warp knitted loop configuration

UNIT V **9**

Principles of jacquard warp knitted patterns; color coding of lapping sequences; working principle of mechanical jacquard and electronic jacquard; various principles involved in jacquard patterning techniques; use of multibar technology with jacquard in creating warp knitted patterns; uses of fabrics produced using jacquard warp knitting machines; principle of double needle bar patterning; machine elements of double needle bar machines; patterning techniques adapted in double needle bar machines - plush, shawl and fringes, multi tubular net fabrics, sack fabrics etc.; uses of fabrics produced using double needle bar machines

TOTAL: 45 PERIODS

REFERENCES

1. Thomas D.G.B., “An Introduction to Warp Knitting”, Merrow Publishing Company, UK., 1971, ISBN-13: 9780900541070
2. Sam Raz, “Warp Knitting Production”, Melliand Textilberichte GmbH, Heidelberg, Germany, 1987, ISBN:3-87529-022-4
3. Die Maschenbindungen der Kettenwirkerai, “An Introduction to the Stitch Formations in warp Knitting”, published Employee's Association, Karl Mayere.V., Germany,1966
4. David Spencer, “Knitting Technology”, Pergoman Press, U.K, 1989
5. Paling D.F., “Warp Knitting Technology”, Columbine Press, U.K, 1966
6. Charles Reichman, “Wool and Synthetic Knitwear Handbook”, National Knitted Outerwear Association, U.S.A, 1967
7. Charles Reichman, “Knitted Stretch Technology”, National Knitted Outerwear Association, U.S.A, 1965

TT 9030 ADVANCES IN SPUN BONDED AND MELT BLOWN TECHNOLOGY L T P C
3 0 0 3

UNIT I MELT BLOWN FABRICS 18

Methods of manufacture of melt blown fabrics; fibre formation during melt blown, fibre velocity and acceleration, fibre diameter attenuation, crystallization and orientation, fibre bulk and surface properties of melt blown, melt blowing mixture of polymers; influence of melt blown process conditions like primary air flow rate, secondary air flow rate, curvature of the collector surface etc on fibre properties like diameter, diameter distribution etc.; melt blown modeling

UNIT II SPUN BONDED FABRICS 14

Methods of manufacture of spun bonded fabrics; fibre orientation in spun bonded fabrics; characterization of filament arrangement; modeling in spun bonded fabrics; deformation behavior in spun bonding; effect of processing parameters on spun bonded fabric characteristics like fibre diameter etc.

UNIT III SPUN LACED FABRICS 13

Methods of manufacture of spun laced fabrics; uniformity; texture of spun laced fabrics; use of cotton in spun laced systems; modeling spun laced fabrics,effect of processing parameters like energy in water etc. on fabric properties, structure property relationships in spun laced systems

TOTAL : 45 PERIODS

REFERENCES

1. Lunenschloss J., Albrecht W. and David Sharp., “Non-woven Bonded Fabrics”, Ellis Horwood Ltd, New York, 1985, ISBN: 0-85312-636-4.
2. Gulrajani M.L., “Non wovens”, Textile Institute, Manchester, 1992.
3. Mrstina V. and Feigl F., “Needle punching Textile Technology”, Elsevier, New York, 1990.
4. Dharmadhikary R.K., Gilmore T.F., Davis H.A. and Batra S.K., “Thermal bonding of nonwoven fabrics”, Textile Progress, Vol.26, No.2, Textile Institute Manchester, 1995, ISBN: 1870812786
5. Jirsak O. and Wadsworth L.C., “Non woven Textiles”, Textile Institute, Manchester, 1999, ISBN: 0 89089 9788
6. Russell S., “Hand book of nonwovens”, Textile Institute, Manchester, 2004, ISBN: 1 85573 603 9.
7. “The Spun Bonded and Melt Blown Technology hand book”, Association of the Non - woven fabric industry India, 1999.

TT 9031 COLOUR SCIENCE, MEASUREMENT AND ITS APPLICATIONS L T P C
3 0 0 3

UNIT I COLOUR SCIENCE 13

Perception of color – mechanism of color vision, color vision theories, defects in color vision, color vision tests; additive and subtractive color mixing; confusion in color perception; Beer’s Law, Lambert’s Law and Kubelka - Munk’s simplified model of theory of interaction of matter and radiation

UNIT II COLOUR ORDER SYSTEMS 9

Description of color; various color order systems; CIE system and its components; illuminants; standard observer; chromaticity diagram

UNIT III COLOUR MATCHING 9

Reflectance curves of dyed samples; application of the Kubelka - Munk theory to color matching; techniques of computer color matching; prediction of color recipe; limitations of computer color matching

UNIT IV METAMERISM 5

Illuminant metamerism; observer metamerism; geometric metamerism; assessment of metamerism; metamerism in textiles

UNIT V COLOUR DIFFERENCE MEASUREMENTS AND COLOUR ASSESSMENT IN TEXTILES 9

Visual colour assessment; variables, standard conditions and methods of visual assessment; instrumental colour assessment; colour difference equations and measurements (LAB/LUV scales); pass fail standards

TOTAL : 45 PERIODS

REFERENCES

1. Shah H. S. and Gandhi R. S., “Instrumental colour measurement and computer aided colour matching for textiles”, Mahajan Book Publication, 1990.
2. Park J., “Instumental Colour formulation: A Practical guide”, Woodhead Publishing, 1993, ISBN 0 901956 54 6.
3. Choudhury A. K. R., “Modern concepts of colour and appearance”, Oxford and IBH Publishing Ltd, 2000.
4. Sule A. D., “Computer colour analysis”, New Age International Publishers, 2002.
5. Mc Laren K., “The color science of Dyes & Pigments”, Adam Hilger Ltd., 1983, ISBN 0-85274-426-9.

TT 9032 FABRIC AND GARMENT FINISHING L T P C
3 0 0 3

UNIT I 13

Garment dyeing - selection of fabrics, selection of garment accessories, fabric and sewing thread selection, selection of dyes; garment - dyeing machinery

UNIT II 9

Washing - stone washing, acid washing, enzyme washing, bio polishing, emerisation; bleaching; laser fading; ozone fading

UNIT III 9

Finishing - optical brightening; mercerization; liquid ammonia treatment

UNIT IV 9

Stiffening; softening; crease resistant and crease retentive finish; anti-static finish; anti- bacterial finish; waterproofing; flame proofing; soil release finish; mildew and moth proofing

UNIT V 5

Stain removal; care labels; laundering equipment and procedures.

TOTAL : 45 PERIODS

REFERENCES
1. Harrison P. (ed.), “Garment Dyeing: Ready to wear fashion from the dye house”, The Textile Institute, U.K., 1988 ISBN: 1870812131.
2. Noemia D’ Souza, “Fabric Care”, New Age International (P) Ltd Publisher., Chennai ,1998, ISBN: 81-224-1143-6.
3. Hall A.J., “Textile Finishing”, Elsevier Publishing Co. Ltd., 1986.
4. Marsh J.T., “An Introduction to Textile Finishing”, Chapman and Hall Ltd., London, 1979.
5. Shenai V.A., “Technology of Textile Finishing”, Sevak Publications, Bombay, 1995.
6. Perkins W.S., “Textile Coloration and Finishing”, Carolina Academic Press, 1995.

TT 9033 SYNTHETIC FIBRE COLORATION L T P C
3 0 0 3

UNIT I MASS COLOURATION 9

Different methods of mass colouration, mass colouration of polymers - polyester, nylon, acrylic and polypropylene

UNIT II PRETREATMENTS 9

Pretreatments for polyester, nylon, acrylic and polypropylene fabrics, pretreatments for blends - polyester/cotton, polyester/wool, acrylic/wool and acrylic /cotton

UNIT III DYEING OF POLYESTER AND POLYPROPYLENE 9

Different mechanisms of dyeing polyester, dyeing of textured polyester, differentially dyeable polyester and its blends, carrier free dyeable polyester; dyeing of polyester blends - polyester/cotton and polyester/wool; dyeing of unmodified and modified polypropylene

UNIT IV DYEING OF NYLON AND ACRYLIC 9

Dyeing of nylon with acid and disperse dyes, dyeing of polyamide blends, differentially dyeable nylon and its blends; dyeing of acrylic with cationic and disperse dyes, dyeing of acrylic blends, differentially dyeable acrylic and its blends

UNIT V PRINTING 9

Different styles of printing polyester, polyamide and polypropylene fabrics; transfer printing – different systems of transfer printing, heat transfer printing, advantages and limitations

TOTAL : 45 PERIODS

REFERENCES
1. Gulrajani M.L., “Dyeing Polyester and its blends”, IIT, Delhi, 1987.
2. Burkinshaw S.M., “Dyeing of synthetic fibres”, Blackie, 1995.
3. Shore J., "Blends dyeing ", SDC, U.K, 1998. ISBN: 090195446740
4. Datye K.V. and Vaidhya A.A., “Chemical processing of synthetic fibers and blends”, Wiley-Interscience Publication, 1984.
5. Burkinshaw S.M., “Chemical Principles of Synthetic Fibre Dyeing”, Textile Insititute Publication, 1995.

TT 9034 PROCESS CONTROL IN TEXTILE CHEMICAL PROCESSING L T P C
3 0 0 3

UNIT I **9**

Quality control tests for dyes, chemical auxillaries and finishing agents

UNIT II **13**

Quality control tests in singeing, desizing, scouring, bleaching and mercerisation; process control aspects in the above processes

UNIT III **9**

Quality control tests in dyeing and printing; concept of CCM in quality control; process control in dyeing and printing

UNIT IV **9**

Quality Control tests in finishing treatments; process control in above treatments

UNIT V **5**

Quality control tests for eco-labelling; process control measures to achieve eco-standards

TOTAL : 45 PERIODS

REFERENCES

1. Shenai V.A., "Textile Fibres", Vol.1, Edn.3, Sevak Publications, Mumbai, 1995.
2. Shenai V.A., "Chemistry of Dyes and Principles of Dyeing ", Vol. 2, Edn.3, Sevak Publications, Mumbai, 1995.
3. Shenai V.A., "Technology of Bleaching and Mercerizing", Vol. 3, Edn. 3, Sevak Publications, Mumbai, 1995.
4. Shenai V.A., "Technology of Printing", Vol. 4 Edn.3, Sevak Publications,Mumbai, 1995.
5. Shenai V.A., "Technology of Dyeing", Vol. 6, Edn.3, Sevak Publications, Mumbai, 1995.
6. Shenai V.A., "Evaluation of Textile Chemicals", Vol. 8, Edn.3, Sevak Publications, Mumbai, 1995.
7. Shenai V.A., "Fundamental Principles of Textile processing", Vol. 9 Edn.3, Sevak Publications, Mumbai, 1995.
8. Shenai V.A., "Technology of Textile Finishing", Vol. 8 Edn.3, Sevak Publications, Mumbai, 1995.
9. "ISI Handbook of Textile Testing", Indian Standard Institution (Delhi), New Delhi, 1995.
10. Vaidya A.A. and Datye K.K., "Chemical processing of synthetic and blends", John Wiley and Sons, New York, 1990.
11. "Symposium proceedings on Eco-Friendly textile processing", Department of textile technology, Indian Institute of Textile Technology, New Delhi, 1995.

TT 9035 CAD AND CAM FOR TEXTILES AND APPARELS L T P C
3 0 0 3

UNIT I BASIC CONCEPTS **9**

Developments in computers and information technology; networking- hardware and software; overview of CAD and CAM and their application in various fields of textiles

UNIT II DESIGN SOFTWARE BASICS **9**

AUTOCAD and its emulators; specific software for textile applications; CIE color system and the true color representation; concepts of image processing; graphics – basics, raster, vector graphics and file formats, virtual reality modeling

UNIT III COMPUTER AIDED DESIGN 5

Weave patterns, printable designs - generation using computers, CAD / CAM in garment manufacturing; complete pattern design system in preparation for grading, marker making and pattern manipulation

UNIT IV COMPUTER AIDED MANUFACTURING 13

Control theory, instrumentation and control loops, system analysis of computer controller machines in spinning, weaving, processing and garment industry; robots in textiles, computerized on-line and off- line testers

UNIT V MANAGEMENT 9

Computer applications for management function, management information system in garment industry; EDI in garment technology; concept of Enterprise Resource Planning (ERP) and computerization in exports / documentation.

TOTAL: 45 PERIODS

REFERENCES

1. Vesant C. E., “Computer Aided Design and Manufacture”, Ellis Harwood-England, 1983.
2. Gray S., “CAD/CAM in clothing & Textiles”, Grower Publishing, England, 1998.
3. Sigmon D.M., Grady P.L and Winchesters S.L. “Computer Integrated Manufacturing and total quality management”, Textile Progress, Vol. 27, No.4, Text.Inst, ISBN: 1870372166.
4. Stephen Gray, "CAD/CAM in Clothing and Textiles", Gower Publishing Limited, 1998, ISBN 0-566-07673X.
5. Compilation of Papers Presented at the Annual World Conference, "Computers in the World of Textiles", 1984, Hong Kong, The Textile Institute, ISBN: 0-0900739-69X.
6. Aldrich W., "CAD in Clothing and Textiles", 2nd edition, Blackwell Science, 1992, ISBN: 0-63 -3893 -4.
7. Jacob Solinger, "Apparel Manufacturing Handbook", VanNoStrand and Reinhold Company, 1980, ISBN: 0-442-21904-0.

TT 9036 QUALITY ASSURANCE IN GARMENT INDUSTRY L T P C

3 0 0 3

UNIT I 9

Design satisfaction tests - fabric specification, cloth defects, various point systems, shrinkage potential

UNIT II 13

Garment specification; manufacturing specification; name of operation and associated details in respect of sewing, dyeing and washing of garments; Style features, trims specification, stitch specification, size scale; garment dimensions and tolerances; quality of trims and accessories.

UNIT III 9

Defects in garments and their remedies - A, B and C zones in a garment with respect to defects

UNIT IV 9

Quality management concepts; quality control and inspections; S.Q.C.; acceptance sampling; T.Q.M.; I.S.O.

UNIT V **5**

Laboratory testing for quality and performance

TOTAL : 45 PERIODS

REFERENCES

1. Pradip V. Mehta., " Managing quality in the apparel industry ", New Age International, Chennai, 1998.
2. Sigmon D.M., Grady P.L., and Winchester S.C., " Computer Integrated Manufacturing and Total Quality Management", Textile Progress, The Textile Institute, Manchester, 1998.
3. Laing R.M. and Webster J., " Stitches and Seams ", The Textile Institute, Manchester, 1998.
4. Glock R.E. and Kunz G.I., " Apparel Manufacturing: Sewn Product Analysis ", Prentice Hall, 1995.
5. Mehta P.V., " An Introduction to Quality Control for the Apparel Industry ", Marcel Dekker, 1992.
6. Cooklin G., " Garment Technology for Fashion Designers ", Blackwell Science, 1997.

TT 9037 **PROTECTIVE GARMENTS** **LT P C**
3 0 0 3

UNIT I FIBRES, YARNS AND FABRICS FOR PROTECTIVE GARMENTS 9

Selection of fibres-suitability and properties of high performance fibres for various protective clothing, chemical composition and physical structure, characteristics and working of various fibres according to different end uses like thermal protection, ballistic protection, anti-microbial protection, Protection against cold etc.

Yarn and fabric (knitted, woven and Non-woven) parameters, their methods of production, effect of structure on their performance; use of composite materials in yarn and fabric formation used for protective end uses

UNIT II CHEMICAL FINISHES FOR PROTECTIVE GARMENTS 9

Use of coated fabrics – different types of finishes like fire retardant finishes, for different textile materials, water repellent finishes, anti-microbial finishes; chemical finishes against radiation and chemicals – method of application of those finishes; machines and techniques used for such applications; protective finishes for health care garments

UNIT III PROTECTIVE GARMENTS IN OTHER APPLICATIONS 9

Protective fabrics used in the medical field and in hygiene; military combat clothing; protective fabrics against biological and chemical warfare; textiles for high visibility

UNIT IV GARMENT CONSTRUCTION 9

Garment construction - method of construction of garments according to various protective end uses like protection against cold, heat, chemical, ballistic protection etc.; use of different fabric type - knitted, woven, and Non-woven; coated / laminated in protective applications different places; use of inter lining and composites

UNIT V EVALUATION OF PROTECTIVE GARMENTS 9

Evaluation of protective fabrics - desirable properties of protective textiles, method of testing for thermal protective performance, water, cold, abrasion and wear resistance; evaluation of resistance in to mildew, ageing, sunlight, chemical, electrostatic and electrical resistivity, impact properties; ASTM standards for protective garments

TOTAL : 45 PERIODS

REFERENCES

1. Adanur S., "Wellington sears handbook of Industrial textiles", Technomic publishing co inc, 1995, ISBN : 1 – 56676 – 340 – 1.
2. Pushpa Bajaj and Sengupta A.K., "Protective clothing", The Textile Institute, 1992, ISBN :1-870812 – 44-1.
3. Chellamani K.P. and Chattopadhyay D., "Yarns and Technical Textiles", SITRA, 1999.
4. Scott R.A.,"Textiles for protection", Woodhead Publishing Limited, Cambridge, UK, ISBN :1-85573-921-6, 2005.
5. Saville.B.P., "Physical testing of textiles", Woodhead Publishing Limited, Cambridge, UK, ISBN :1-85573-367-6, 1999.
6. Fan Q., "Chemical Testing of Textiles", Woodhead Publishing Limited, Cambridge, UK, ISBN :1-85573-917-8, 2005.
7. Long A.C., "Design and manufacture of Textile Composities", Woodhead Publishing Limited, Cambridge, UK, ISBN : 1-85573-744-2, 2005.
8. Fung W., "Coated and laminated textiles", Woodhead Publishing Limited, Cambridge, UK, ISBN :1-85573-576-8, 2002.
9. Horrocks A.R. and Anand S.C., "Handbook of Technical Textiles", Woodhead Publishing Limited, Cambridge, UK, ISBN :1-85573-385-4, 2004.
10. Anand S.C., Kennedy J.F., Miraftab M. and Rajendran S., "Medical textiles and biomaterials for health care", Woodhead Publishing Limited, Cambridge, UK, ISBN: 1-85573-683-7, 2006.

TT 9038 INDUSTRIAL ENGINEERING FOR TEXTILE AND APPAREL INDUSTRIES

L T P C
3 0 0 3

UNIT I **5**

Industrial Engineering - evolution, functions, role of industrial engineer

UNIT II **13**

Methods study – introduction, techniques of recording; method analysis techniques; principles of motion economy; method study in garment manufacture; ergonomics- importance, workplace design, fatigue

UNIT III **13**

Work measurement – introduction; time study – equipment and procedure; standard data; predetermined time standards; work sampling techniques; incentive wage system; work measurement applied to garment industry

UNIT IV **5**

Site selection for textile industry; plant layout - types of layouts suitable for textile industry, methods to construct layout; line balancing

UNIT V **9**

Statistical Process Control – data collection; concept of AQL, control charts in quality control; process capability

TOTAL: 45 PERIODS

REFERENCES
1. Khanna O. P. and Sarup A., “Industrial Engineering and Management”, Dhanpat Rai Publications, New Delhi, 2005.
2. "Industrial engineering manual for textile industry ", Wiley Eastern (P) Ltd., New Delhi, 1988.
3. "Introduction to work study ", ILO, Geneva, 1989.
4. Enrick N. L., "Time study manual for Textile industry", Wiley Eastern (P) Ltd., 1989.
5. Chuter A. J., "Introduction to clothing production management", Black well science, U. S. A., 1995.
6. Richard I. Levin. and David S. Rubin., “Statistics for Management”, 7th edition, Prentice Hall of India Pvt. Ltd., New Delhi, 1997.
7. David M. Levine, Timothy C. Krehbiel and Mark L. Berenson., “Business Statistics: A First Course”, Pearson Education Asia, New Delhi, 2nd edition, 2000.
8. Panneerselvam R., “Production and Operation Management”, Prentice Hall of India, 2002.
9. Edward S. Buffa and Rakesh Sarin., “Modern Production and Operations Management”, John Wiley & sons, U. S. A., 1987.
10. Lee J. Krajewski and Larry P. Ritzman., “Operations Management: Strategy and Analysis”, Addison Wesley, 2000.
11. Chase., Aquilano and Jacobs., “Production and Operations Management”, Tata McGraw-Hill, New Delhi, 8th Edition, 1999.

TT 9039 ENERGY MANAGEMENT IN TEXTILE INDUSTRY L T P C
3 0 0 3

UNIT I **9**

Source of energy; limitations of natural sources

UNIT II **9**

New technologies for energy; unexploited energy resources and problems in their exploitation

UNIT III **9**

Total energy concept; energy consumption in spinning, weaving and processing; conservation of energy in such processes

UNIT IV **9**

Techniques of energy saving; modification of technology or techniques towards saving in energy

UNIT V **9**

Scope of utilisation of by products for energy production; captive power generation and its economics

TOTAL: 45 PERIODS

REFERENCES
1. "Heat economy in Textile mills ", ATIRA, Ahmedabad, 1984.
2. "Energy conservation in Textile Industry ", SITRA, Coimbatore, 1979.
3. Viallier P., " Energy uses in the Textile finishing industry " Eurotex, 1990.
4. Sang Yang Kim, Grady, P.L. and Hersh S.P.," Energy consumption and conservation in the fibre producing and textile industry ", T.P., Vol. 13, No.3, Textile Inst., 1983.

TT 9040 TEXTILE MILL PLANNING AND MANAGEMENT L T P C
3 0 0 3

UNIT I **13**
Principles of management; selection of site for textile mills; plant layout – types of layout, advantages and disadvantages of different types of layouts; building structure; balancing of machinery for spinning, weaving and garment unit

UNIT II **5**
Maintenance of machinery – types of maintenance, comparison between different systems of maintenance, maintenance schedule for spinning and weaving machinery; lubricants – types and characteristics

UNIT III **9**
Lighting for textile mills; humidification and ventilation - R.H requirements, air conditioning, various systems of air conditioning and humidification; electrical power and drives of various textile machinery

UNIT IV **9**
Material handling in textile mills; selection and training of operatives; workload of operatives in spinning, weaving mills and garment unit; personnel management – functions in textile mills

UNIT V **9**
Preparation of financial statements - balance sheet and profit and loss account; determination of the cost of yarn, fabric and garment

TOTAL : 45 PERIODS

REFERENCES

1. Shukla M.C., " Business Organisation and Management ", Sultan Chand and Sons, 1975.
2. Dudeja D.V., " Management of textile industries ", Textile Press, Ahmedabad 1981.
3. Jaganathan V., "Textile mill Technical Data Book ", Mahajan brothers, Ahmedabad, 1976.
4. Ormerod A., " Textile Project Management ", Textile Institute Manchester, 1992.
5. "Management in the textile industries: Textile Institute Manchester ", Longmans, London, 1988.

TT 9041 OPERATIONS RESEARCH L T P C
3 0 0 3

UNIT I LINEAR PROGRAMMING **13**
Formulation of LP problem; solution of LP problem - graphical method, simplex method, dual simplex method; solution to pure and mixed integer programming problem by Branch and bound algorithm

UNIT II TRANSPORTATION PROBLEM **9**
Northwest corner, least cost, Vogel's approximation method; application of optimality test; solution to assignment problems, unbalanced assignment, infeasible assignment problems

UNIT III INVENTORY CONTROL **5**
ABC analysis; fixation of inventory level, EOQ (Wilson's Formula), problems related to above theoretical aspects

UNIT IV PERT / CPM **9**

CPM and PERT networks - finding critical path, probability and cost consideration in the project scheduling

UNIT V GAME THEORY AND QUEING THEORY **9**

Game theory – two person zero sum games, saddle point, Dominance rule, graphical method. matrices method; Queuing theory – basic elements of queuing model, single and multi channel models- infinite number of customers and infinite calling source

TOTAL : 45 PERIODS

REFERENCES

1. Heizer J. and Render B., "Production and Operations Management", Prentice Hall, New Jersey, 1993, ISBN: 0-205-14048-3.
2. Hamdy A. and Taha, "Operations Research an introduction", Maxmillan Publishing Company, New York, Third Edition, 1982.
3. Panneerselvam R., "Operations Research", Prentice Hall of india, 4 th print, 2003.
4. Hamdy A. and Taha, "An introduction to Operations Research", Maxmillan Publishing Company, New York, V th edition, 1996.
5. Narayan Bhat U., "Elements of Applied Stochastic processes", John Wiley and Sons, New York, 1972.
6. Fredrick S., Hiller and Gerald J Liberman., "Introduction to Operations Research", Industrial Engineering Series, International edition, McGraw-Hill, New York, 1995.

TT 9042 PRODUCTION AND OPERATIONS MANAGEMENT L T P C

3 0 0 3

UNIT I **9**

Factors of production; environmental and social concerns of operations; design of production system; forecasting in production and operation management – various qualitative and quantitative techniques

UNIT II **9**

Capacity planning – single stage system, multistage system; facility planning – objectives; different types of layouts, developing process layout, product layout; job design techniques

UNIT III **9**

Aggregate production planning – procedure, importance; scheduling in operation management – mass production system, batch and job shop

UNIT IV **9**

Material management – material planning, purchase, stores, material handling and disposal; inventory models – basic inventory model, gradual replacement model, basic model with backlogging, bulk discount model, independent demand system for multiple products, models with uncertain demand, multiple period model; MRP-objectives, elements of MRP, MRP computation, implementation

UNIT V **9**

Concepts - Total Productive Maintenance, Autonomous Maintenance, Just In Time, Total Quality Management, Automated Technology, Hard Technology, Soft Technology, Hybrid Technology, CIM, CAD, GT, CAM, CAPP, robotic FMS; application of MIS in production and operations management

TOTAL : 45 PERIODS

REFERENCES
1. Buffa E.S. and Sarin R.K., "Modern Production / Operations Management", John Wiley & Sons. Inc., 1994.
2. Taha H.A., "Operations Research: An Introduction", Prentice Hall of India, New Delhi, 1997.
3. Adam Jr. E.E. and Elber R.J., "Production and Operations Management", Prentice Hall of India, New Delhi, 1997.
4. Chary S.N., "Production and Operations Management", Tata McGraw-Hill, New Delhi, 1988.
5. Narasimhan S.L., Mcleavy, D.W. and Billington P.J., "Production Planning and Inventory Control", Prentice Hall of India, New Delhi, 1997.
6. Grant Ireson., "Factory Planning & Plant Layout", Prentice Hall, New Jersey, 1952.

TT 9043 PERSONNEL MANAGEMENT IN APPAREL INDUSTRY L T P C
3 0 0 3

UNIT I **9**

Human resource development systems – concepts and structure; personnel management-characteristics, objectives, functions and operations; organization chart; role of personnel managers in the organisation, apparel units

UNIT II **9**

Man power planning – objectives, planning for future; methods of recruitment, process of recruitment and induction; training - objectives, methods; management development –concepts, objectives and techniques; career planning and development; man power planning, recruitment and training in the apparel industry

UNIT III **9**

Job analysis, description, evaluation, hierarchy of human needs - creating motivation, types of motivation; job enrichment; performance measurement – objective, methods; wage policy; industrial pay structure - components, laws and methods of payment; methods of wage fixation; laws governing employees benefits and welfare; wage, salary administration and type of motivation applied in apparel industry

UNIT IV **9**

Factories Acts - Industrial Disputes Acts, Payment of Wages Act, Minimum Wages Act, Payment of Bonus Act, Workmen Compensation Act, Employees State Insurance Act, Employees Provident Fund Act, Payment of Gratuity Act; employee discipline – disciplinary actions, rules and procedures; suspension, dismissal and retrenchment – rules and procedures; grievances handling

UNIT V **9**

Role of trade unions – goals and objectives, Indian context; Trade Union Act; collective bargaining-concepts, functions, position in India; industrial disputes – problems and solutions; industrial democracy; workers participation in management

TOTAL : 45 PERIODS

REFERENCES
1. Peter F. Drucker., "Management task, responsibilities, practices", Allied Publishers, Kolkatta, 1992.
2. Dayal S., "Industrial relations systems in India", Sterling Publishers Pvt Ltd., New Delhi, 1980.

3. Yoder D. and Paul Standohar D., “Personal management and industrial relations”, Prentice Hall of India Pvt. Ltd, New Delhi, 1984.
4. Tripathi P.C., “Personal management and industrial relations”, Sultan Chand and Sons, New Delhi, 1988.
5. Monappa, Arun, Saiyaddain and Mirza S., “Personnel management”, Tata McGraw Hill, Bombay, 1983.
6. Misra S.N., “Labour and Industrial Laws”, Pioneer Publications, New Delhi, 1983.
7. Ramaswamy E.A. and Uma Ramaswamy., “Industry and labour”, Oxford, New Delhi, 1981.

TT 9044 TEXTILE PRODUCT ENGINEERING L T P C
3 0 0 3

UNIT I INTRODUCTION 5
Factors to be considered while designing a textile product; standardization of product parameters

UNIT II FIBRE ENGINEERING 9
Engineering a fibre for a given end use – concepts, modification of the fibre structure

UNIT III YARN ENGINEERING 13
Engineering a yarn using staple and filament fibre for a given end use - concepts of yarn engineering, different yarn constructions, different spinning systems; yarn design elements

UNIT IV FABRIC ENGINEERING 13
Engineering a fabric - woven, knit and bonded fabric for a given end use - concepts of fabric engineering, structure-property relationship

UNIT V GARMENT ENGINEERING 5
Engineering garments from application point of view. interaction between fibre, yarn and fabrics on the properties of garments

TOTAL : 45 PERIODS

REFERENCES
1. Matsuo T. and Suresh M.N., “The design logic of textile products”, Textile progress, Vol. 27, No3, Textile Inst, ISBN: 1870372018.
2. Hearle J.W.S., “Textile Design”, Journal of the Textile Institute, Vol. 80, Part 3.

TT 9045 COMPUTER PROGRAMMING FOR TEXTILE TECHNOLOGISTS L T P C
3 0 0 3

UNIT I 9
File handling and object creation in Object Oriented Programming; equation solution -cotton mixing, linear programming

UNIT II 9
Image Analysis – Understanding steps in image processing for applications, filament yarn count, diameter, diameter variation, blend homogeneity, yarn packing density and radial packing density, fibre migration in yarn

UNIT III **9**

Hypothesis testing; correlation and regression; Anova

UNIT IV **9**

Programming for computerized colour matching; graphical programming – crank simulation

UNIT V **9**

Serial port programming; ADC setup data acquisition and plotting; closed loop control setup and programming – PID; web server setup and scripting for authenticated data service

TOTAL : 45 PERIODS

REFERENCES

1. Gray S., “CAD/CAM in clothing & Textiles”, Grower Publishing, England, 1998.
2. Stephen Gray, "CAD/CAM in Clothing and Textiles", Gower Publishing Limited, 1998, ISBN 0-566-07673X.
3. Aldrich W., "CAD in Clothing and Textiles", 2nd edition, Blackwell Science, 1992, ISBN: 0-63 -3893 -4.
4. Shah H. S. and Gandhi R. S., “Instrumental colour measurements and computer aided colour matching for textiles,” Mahajan Book Publications, 1990.
5. Hamdy A. and Taha, “Operations Research an introduction”, Maxmillan Publishing Company, New York, Third Edition, 1982.
6. Panneerselvam R., “Operations Research”, Prentice Hall of India, 4 th print, 2003.
7. R. C. Gonzalez, R. E. Woods “Digital Image Processing” Second Edition, Pearson Education Inc. 2005

TT 9046 INDUSTRIAL MANAGEMENT FOR TEXTILE AND APPAREL INDUSTRIES

L T P C
3 0 0 3

UNIT I **9**

Factory location - factors determining location of factory, steps in location – subjective, qualitative and quantitative methods; plant layout – types, flow and activity analysis, suitable layout for textile industry

UNIT II **9**

Work environment - importance, factors affecting work environment - lighting, ventilation, humidification and air-conditioning, sanitation, noise and pollution control; ergonomics – importance, application in garment unit; production planning and control - objectives, functions - routing, scheduling, dispatching and follow up; limitations; PPC in textile industry; inventory management and control - ABC Analysis - VED classification - stock levels – EOQ

UNIT III **9**

Principles of management; management by objective; management by crisis; management by exception; personal management – scope and objective, importance in textile industry; job description and specification; manpower planning, recruitment and selection; tests and interview techniques - recruitment for different levels for a spinning, weaving, chemical processing mill and garment unit

UNIT IV **9**

Employee training - need, steps in training programmes, methods of training, training evaluation applied to spinning, weaving mill and garment unit; performance appraisal - meaning, purposes, methods, ethics in appraisal; employee communication – mode, barriers; employee motivation – theory, practice in garment units; job transfer and promotion, layoff and retrenchment, dismissal and discharge; job enlargement and job enrichment;

UNIT V **9**

Work Study - concept, importance, basic work study procedure; labor productivity measurement, ways of improving; wage and salary administration – purpose; methods of wage payment - time, piece, incentive systems – different plans; industrial relations - importance, participants in industrial relations, workers participation in management, collective and productivity bargaining; employee morale - definition, types, factors affecting employee morale, methods of measuring morale, improving morale; employee welfare – concept, labour welfare practices in India

TOTAL: 45 PERIODS

REFERENCES

1. Buffa E.S. and Sarin R.K., “Modern Production / Operations Management”, John Wiley & Sons. Inc., 1994.
2. Adam Jr. E.E. and Elber R.J., “Production and Operations Management”, Prentice Hall of India, New Delhi, 1997.
3. Narasimhan S.L., Mcleavy, D.W. and Billington P.J., “Production Planning and Inventory Control”, Prentice Hall of India, New Delhi, 1997.
4. Peter F. Drucker., “Management task, responsibilities, practices”, Allied Publishers, Kolkatta, 1992.
5. Dayal S., “Industrial relations systems in India”, Sterling Publishers Pvt Ltd., New Delhi, 1980.
6. Yoder D. and Paul Standohar D., “Personal management and industrial relations”, Prentice Hall of India Pvt. Ltd, New Delhi, 1984.
7. Monappa, Arun, Saiyaddain and Mirza S., “Personnel management”, Tata McGraw Hill, Bombay, 1983.
8. Misra S.N., “Labour and Industrial Laws”, Pioneer Publications, New Delhi, 1983.
9. Punekar, S. D. and Deodhar S. B., "Labour Welfare, Trade Unionism and Industrial Relations", HPH, 2003.
10. Khanna O. P. and Sarup A., “Industrial Engineering and Management”, Dhanpat Rai Publications, New Delhi, 2005.

GE9021 **PROFESSIONAL ETHICS IN ENGINEERING** **L T P C**
3 0 0 3

AIM

To sensitize the engineering students on blending both technical and ethical responsibilities.

OBJECTIVES

- Identify the core values that shape the ethical behavior of an engineer.
- Utilize opportunities to explore one’s own values in ethical issues.
- Become aware of ethical concerns and conflicts.
- Enhance familiarity with codes of conduct.
- Increase the ability to recognize and resolve ethical dilemmas.

UNIT I ENGINEERING ETHICS 9

Senses of 'Engineering Ethics' – Variety of moral issues – Types of inquiry – Moral dilemmas – Moral Autonomy – Kohlberg's theory – Gilligan's theory – Consensus and Controversy – Professions and Professionalism – Professional Ideals and Virtues – Uses of Ethical Theories.

UNIT II ENGINEERING AS SOCIAL EXPERIMENTATION 9

Engineering as Experimentation – Engineers as responsible Experimenters – Research Ethics - Codes of Ethics – Industrial Standards - A Balanced Outlook on Law – The Challenger Case Study

UNIT III ENGINEER'S RESPONSIBILITY FOR SAFETY 9

Safety and Risk – Assessment of Safety and Risk – Risk Benefit Analysis – Reducing Risk – The Government Regulator's Approach to Risk - Chernobyl Case Studies and Bhopal

UNIT IV RESPONSIBILITIES AND RIGHTS 9

Collegiality and Loyalty – Respect for Authority – Collective Bargaining – Confidentiality – Conflicts of Interest – Occupational Crime – Professional Rights – Employee Rights – Intellectual Property Rights (IPR) - Discrimination

UNIT V GLOBAL ISSUES 9

Multinational Corporations – Business Ethics - Environmental Ethics – Computer Ethics - Role in Technological Development – Weapons Development – Engineers as Managers – Consulting Engineers – Engineers as Expert Witnesses and Advisors – Honesty – Moral Leadership – Sample Code of Conduct

TOTAL: 45 PERIODS

TEXT BOOKS

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw Hill, New York (2005).
2. Charles E Harris, Michael S Pritchard and Michael J Rabins, "Engineering Ethics Concepts and Cases", Thompson Learning, (2000).

REFERENCES

1. Charles D Fleddermann, "Engineering Ethics", Prentice Hall, New Mexico, (1999).
2. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, (2003)
3. Edmund G Seebauer and Robert L Barry, "Fundamentals of Ethics for Scientists and Engineers", Oxford University Press, (2001)
4. Prof. (Col) P S Bajaj and Dr. Raj Agrawal, "Business Ethics – An Indian Perspective", Biztantra, New Delhi, (2004)
5. David Ermann and Michele S Shauf, "Computers, Ethics and Society", Oxford University Press, (2003)