

REVISED SYLLABUS W.E.F.01ST JULY, 2005

T.Y.B.TEXT. (TC) SEMESTER-I

SR. NO.	COMMITTON TO COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB. TOTAL
5.1	TT/MMTT/TPE/TC	TEXTILE ELECTRONICS-II	3	---	---	2	100	---	---	50	150
5.2	TC	TECHNOLOGY OF DYEING-I	4	---	---	3	100	25	---	50	175
5.3	TC	TECHNOLOGY OF PRINTING-I	3	---	---	3	100	25	---	50	175
5.4	TC	TECHNOLOGY OF FINISHING-I	3	---	---	3	100	50	---	---	150
5.5	TC	CHEMICAL ENGINEERING OPERATIONS	3	---	---	---	100	---	---	---	100
5.6	* TC	* PHYSICAL CHARACTERISTICS OF TEXTILE FIBRES	3	---	---	---	100	---	---	---	100
5.7	TT/MMTT/TPE/TC	INPLANT TRAINING-I	---	---	---	---	---	50	---	---	50
			19	---	---	11	600	150	---	150	900
L =LECTURES T =TUTORIALS DR=DRAWING PR=PRACTICALS			TP=THEORY PAPER TW=TERM WORK OE=ORAL EXAMINATION PE=PRACTICAL XAMINATION								

THIRD YEAR B.TEXT. - SEMESTER - I

5.1 TEXTILE ELECTRONICS-II (TT/MMTT/TPE/TC)

Lectures	-	3 hrs/week.
Practicals	-	2 hrs/week.
Theory Paper	-	100 marks.
Practical Exam.	-	50 marks.
Subject Total	-	150 marks.

1) Digital Electronics and Number System :-

Difference between digital and analog, digital gates, working, truth table & Boolean equation, with examples from TTL family.

Digital Circuits :- Introduction to multiplexers, Demultiplexers, Encoders, decoders, Flip Flop – R-S, D & J – K, Registers Latches, binary counter, buffers, Tri state devices, memories – RAM, ROM, EPROM.

Introduction to Number systems :- Decimal, Binary, hexadecimal, conversion of numbers from one system to other. Binary arithmetic – addition, subtraction, two's complement representation.

2) 8085 Microprocessor :-

Introduction to microprocessor, features of 8085, Architecture of 8085 – Register section, ALU, Timing & Control etc. Demultiplexing of address data bus. Generation of control signals, Example of microprocessor based system, 8085 machine cycles and bus timing. Memory interfacing to 8085.

3) Programming of 8085 :-

Instruction classification, instruction and data formats, addressing modes, complete instruction set, assembly language programming, Execution of programs, programming with looping, counting & indexing techniques. Time delay's & counters.

4) Stacks and Subroutine :-

Stack, subroutine, call & Return instructions advanced subroutine concepts.

5) Interfacing Input / output devices :-

Basic interfacing concept, interfacing output displays, interfacing input devices, difference between peripheral Input/output memory mapped Input/out.

6) Interrupts :-

Concept of interrupts, software & hardware interrupts, Description of interrupt process, vectored interrupts, programming using interrupts.

7) Interfacing of peripherals & other I/O devices :-

8255 PPI interfacing & programming, interfacing of keyboard (matrix) & display, interfacing of thumbwheel switches, stepper motor, D/A & A/D converters, Relays etc.

8) Introduction to Microcontroller:-

Introduction to microcontroller, Block diagram of microcontroller, Difference between microprocessor and microcontroller, Features of 8051 microcontroller, Introduction to PLC & its applications.

9) Applications of Microprocessor in Textiles :-

Use of Microprocessor / Microcontroller in Sizing Machine, Jet dyeing machine, advanced looms, Spinning machines, Ring data System, Auto levelers, On-line monitoring systems, Evenness tester.

LIST OF EXPERIMENTS

- 1) Study of basic gates.
- 2) Study of flip flops
- 3) Assembly language programmes (6 to 8)
- 4) Interfacing of 8255 in simple I / O & BSR mode.
- 5) Interfacing of Seven segment display.
- 6) Interfacing of keyboard.
- 7) Interfacing of stepper motor.
- 8) Interfacing of D/A converter.
- 9) Interfacing of A/D converter.
- 10) Interfacing of thumbwheel.

REFERENCE BOOKS

- 1) Digital Principles and applications by Malvino & leach.
- 2) Microprocessor Architecture, Programming and applications with 8085 by Ramesh Gaonkar.
- 3) Microprocessor & Digital system by Douglas Hall.
- 4) Fundamentals of microprocessors & microcomputers by B. Ram.
- 5) The 8051 Microcontroller Architecture, Programming and Applications by Kenneth J, Ayala.
- 6) Machine manuals of USTER, LOPHE, PREMIER

THIRD YEAR B. TEXT - SEMESTER-I

5.7 INPLANT TRAINING - I (TT/MMTT/TPE/TC)

Duration	:	4 Weeks
Term Work	:	50 Marks

- 1) As a part of curriculum, students are required to undergo an Inplant training for the period of Four Weeks, after the completion of second semester of Second Year B. Text.
- 2) During this period, students are required to study the machinery, industrial practices & the other relevant data, information as per the guidelines given by the Institute.
- 3) The students are required to submit a Inplant Training Report on the basis of above training.
- 4) Term work marks are assigned on the basis of students performance in the viva – voce, conducted by Internal Examiner immediately after inplant training. A viva-voce will be conducted in the first semester of Third Year B. Text.
- 5) If the performance of the student is found to be unsatisfactory, his terms will not be granted.

THIRD YEAR B. TEXT - SEMESTER-I

5.2 TECHNOLOGY OF DYEING - I (TC)

Lectures	:	4 Hrs / Week
Practicals	:	3 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	25 Marks
Practical Exam.	:	50 Marks
Subject Total	:	175 Marks

- 1) **Preparation of natural fibres for dyeing:** - General theory of cellulosic and protein fibres structure. Effect of different pre treatments like Scouring, Mercerization, Bleaching, Degumming etc. on fibres. Quality parameters required for fabric to be dyed, study of dyeing machinery such as Jiggers, Winches, Package dyeing machine, Continuous dyeing machine.
- 2) **Dyeing with Direct Dyes:** - General principles of application of Direct Dyes. Parameter affecting dye absorption & levelling. Application properties of direct dyes. Batch wise application of direct dyes. Semi & fully continuous dyeing process for direct dyes. After treatments, Effect of finishing treatments on hue and fastness. Problems and remedies in dyeing cotton, viscose, and their blends with direct dyes.
- 3) **Dyeing with Reactive Dyes:** - Reactive Systems, Batch wise dyeing methods, Semi and fully continuous dyeing methods, washing off and after treatments. Stripping of goods dyed with reactive dyes, fastness problems.
- 4) **Dyeing with Vat Dyes:-** Fundamental Principles Dyes, Auxiliaries, Vatting, properties of Leuco dyes, Dyeing, Properties of Dyeings, Fundamental processes, Batch wise, semi continuous and continuous dyeing process. Dyeing of Loose stock, Yarn packages, Hank, Woven Fabric, Knit goods, Dyeing with Indigo, Correction of faulty dyeings.
Solublised Vat - Principle steps involved in dyeing. Batch and continuous methods of dyeing. Problems & remedies in dyeing.
- 5) **Dyeing with Sulphur Dyes:** - Classification and different commercial forms of sulphur dyes. Different Auxiliaries like reducing agents, anti oxidants, Sequestering agent, wetting agents & oxidizing agents. Different application

methods for yarn & fabrics. Batch wise & continuous dyeing methods, problems & remedies in dyeing of cotton with sulphur dyes.

- 6) **Dyeing with Azoic Colours:-** Chemical constitution, Treatment with naphthols, Intermediate treatments, Development, After treatments, Dyeing of yarn & fabric with batch, semi continuous & continuous processes stripping of azoic dyeings.
- 7) **Dyeing with Acid Dyes:** - Classification of acid dyes with mechanism. Factors affecting the acid dyeing of protein fibres. Principles of application of acid dyes to protein fibres. Dyeing of wool & silk.
- 8) **Dyeing with Basic Dyes:-** Mechanism of dyeing. Dyeing assistant. Application of Basic dyes to silk in different characterized bath. Dyeing of wool with basic dyes. Application of Basic dyes to cellulose materials. Stripping of basic dyes. Problems & remedies in dyeing.
- 9) **Dyeing of Ingrain Dyes:-** Application of mineral Khaki & phthalogen blue on cellulose. Dyeing with pigment colours with batch and continuous methods,
- 10) **Dyeing of Natural Dyes:-** Classification of natural dyes, sources, and different methods of application of natural dyes.

LIST OF EXPERIMENTS

- 1) With the help of CCM preparation of Dyeing recipes for dyeing of 100% cotton yarn with HE brand reactive dyes for the given shade in package dyeing machine.
- 2) Dyeing of the cotton yarn with HE brand reactive dyes with the above recipes and assessment of light fastness, wash fastness, fastness to chlorine, Colour difference and metamerism.
- 3) With the help of CCM preparation of Dyeing recipes for dyeing of 100% cotton yarn with vat dyes for the given shade in package dyeing machine.
- 4) Dyeing of the cotton yarn with vat dyes with the above recipes and assessment of light fastness, wash fastness, fastness to chlorine, Colour difference and metamerism.

- 5) Dyeing of the cotton fabric with direct dyes and assessment of light fastness, wash fastness, fastness to chlorine, Colour difference and metamerism.
- 6) Different after treatments on direct dyed fabric and assessment of light fastness, wash fastness, fastness to chlorine, Colour difference and metamerism.
- 7) Dyeing of the 100% cotton fabric with cold brand reactive dyes and assessment of light fastness, wash fastness, fastness to chlorine, Colour difference and metamerism.
- 8) Dyeing 100% cotton knit goods with reactive dyes on a soft flow dyeing machine.
- 9) Dyeing of cotton fabric with different padding methods like cold pad batch, pad bake, pad steam & comparing colour difference on computer colour matching.
- 10) Dyeing of 100% cotton with Leuco Vat & pigmentation process & evaluation of light fastness, wash fastness, fastness to chlorine, Colour difference and metamerism.
- 11) Dyeing of cotton knits in winch with sulphur dye.
- 12) Dyeing of wool & silk with Basic Dye and acid dyes.
- 13) Dyeing of cotton with Mineral Khaki.
- 14) Dyeing with natural dyes.

REFERENCE BOOKS

- 1) Dyeing & chemical Technology of Textile Fibres by E. R. T. Trotman
- 2) The dyeing of cellulose fibres by Clifford Pireston
- 3) Textile processing & properties by T. L. Vigo
- 4) Chemical technology of fibres materials by F. Sadav
- 5) Silk Dyeing printing & finishing by Prof. M. L. Gulrajani
- 6) Technology of Dyeing by Dr. V. A. Shenai.

THIRD YEAR B. TEXT. - SEMESTER-I

5.3 TECHNOLOGY OF PRINTING-I (TC)

Lectures	:	3 Hrs / Week
Practicals	:	3 Hrs / Week
Theory Paper	:	100 Marks
Practical Exam.	:	50 Marks
Term Work	:	25 Marks
Subject Total	:	175 Marks

1) Introduction :-

- Historical background of printing of textiles.
- Preparation of cotton fabric for printing.

2) General:-

Styles of Printing :-

- Direct style of printing and its sequence.
- Discharge style of printing and its sequence.
- Resist style of printing and its sequence.

Fixation of printed textiles :

- Importance of steaming & machinery required.
- Importance of ageing & machinery required.
- Importance of curing / baking & machinery required.

Methods of Printing :-

- General Classification of methods of printing.
- Tie & dye method of printing.
- Batik printing.
- Block printing.

3) Table screen printing :-

- Mechanical features of table.
- Various types of tables.
- Technical features of printing on tables.
- Faults of table screen printing, their causes & remedies.

4) Flat bed screen printing :

- Features of flat bed screen printing m/c. and its various parts.
- Technical features of printing with flat bed printing m/c.
- Flat bed screen printing m/c. for garments.
- Faults of flat bed screen printing m/c. their causes & remedies.

- 5) **Rotary screen printing m/c. -**
- Features of rotary printing m/c. & its various parts.
 - Squeegee system.
 - Technical features of rotary printing m/c.
 - Faults of rotary screen printing m/c. causes & remedies.
- 6) **Inkjet / Digital printing.**
- Basic principles.
 - Mechanism of printing.
 - Requirement of ink
- 7) **Recent developments in flat bed screen printing m/c.**
- Glueing system.
 - Squeegee system
 - Printing system.
- 8) **Recent developments in rotary screen printing m/c.**
- Glueing system.
 - Squeegee system
 - Printing system.
- 9) **Printing paste :-**
- Printing paste ingredients & their functions.
 - Different types of thickeners & their chemistry.
- 10) **Printing with direct dye :-**
- Print paste ingredients for direct style of printing.
 - Print paste ingredients for discharge style of printing on direct dyed ground.
- 11) **Printing with reactive dyes :-**
- Print paste ingredients for direct style of printing.
 - Print paste ingredients for discharge style of printing.
 - Print paste ingredients for resist style of printing.
- 12) **Printing with vat dyes :-**
- Print paste ingredients for direct style of printing.
 - Print paste ingredients for discharge style of printing.
 - Print paste ingredients for resist style of printing.
- 13) **Printing with solublised vat dyes :-**
- Print paste ingredients for direct style of printing.
- 14) **Printing with azoic colours:-**
- Various methods for direct style of printing.

- Rapidogen and Rapid fast colours & their printing.

15) Special print recipes for fashion & garments.

- Khadi
- Metallic
- Floc
- Plastizol
- Reflective
- Pearl

LIST OF EXPERIMENTS

- 1) Tie & dye style of printing.
- 2) Batick Style of printing.
- 3) Direct style of printing with direct dye on flat bed and / or rotary printing machine.
- 4) Discharge style of printing on direct dyed ground on flat bed and / or rotary printing machine.
- 5) Direct style of printing with reactive dyes by various methods on flat bed and / or rotary printing machine.
- 6) Direct style of printing with reactive dyes by various thickeners on flat bed and / or rotary printing machine.
- 7) Discharge & resist style of printing on reactive dyed ground on flat bed and / or rotary printing machine.
- 8) Novel printing effects like Metallic, Pearl and Plastizol on garments.
- 9) Direct style of printing with pigments by using flat bed screen of Roto flat printing m/c.
- 10) Direct style of printing with pigments by using rotary screen of Rotoflat printing m/c.
- 11) Direct style of printing with azoics by using on flat bed and / or rotary printing machine.
- 12) Visit to printing units.

REFERECE BOOKS

- 1) Textile Printing by L.W.C. Miles.
- 2) An Introduction to Textile Printing by W. Clarke.
- 3) Technology of Printing by Dr.V.A. Shenai
- 4) Book of Papers, QIP Summer School on "Advances in Textile Chemical Processing: Edited by Dr. R.B. Chavan.
- 5) Textile Printing Book of papers by Prof. R.B. Chavan.
- 6) Processing of silk by Prof. M.L. Gulrajani.
- 7) Proceedings: Recent advances in Textile Processing lectures/seminer, Dec.1982, I.I.T., Delhi.
- 8) Colourage, ITB International bulletin on dyeing printing & finishing.

THIRD YEAR B.TEXT. – SEMESTER-I

5.4 TECHNOLOGY OF FINISHING-I (TC)

Lectures	:	3 Hrs / Week
Practicals	:	3 Hrs / Week
Theory Paper	:	100 Marks
Term Work	:	50 Marks
Subject Total	:	150 Marks

CHAPTER – I

Object of finishing, Importance of textile finishing, classification of finishing, process sequence of finishing of 100% cotton, 100% Wool & 100% silk fabrics, study of mechanical finishes like Calendering, decatizing, raising, sueding, crabbing, potting, compacting, felting, sanforising, Aero finishing, pressing.

CHAPTER – II –

Principle, working procedure & techno mechanical features of machinery like Calendering, decatizing, raising, sueding, crabbing, potting, compacting, felting, sanforising, Aero finishing, pressing, stenter.

CHAPTER – III – Resin Finishing

Mechanism of creasing and resin finishing, Types of resin finishing, concept of Anticrease, wash-n-wear and Durable Press. Role of catalysts in resin finishing. Classification of resins and catalysts. Concept of deferred cure and post cure. Limitations of resin finishing. Causes of strength loss of resin finished fabric. Various approaches towards reducing the strength loss of resin finished goods. Mechanism of chlorine retention. Mechanism of formal dehyde release. Various methods to reduce formal dehyde release. Eco-friendly cross linking agents. Low and ultra low formal dehyde resins. Resin finishing formulations for 100% Cotton garments, 100% cotton shirting, 100% cotton suiting.

CHAPTER – IV – Flame Retardancy

Concept of flame proof and flame retardancy. Limiting oxygen Index and its importance, Thermal behaviour of textile fibres. Concept of solid phase and Gas phase flame retardant. Classification of flame retardants. Mechanism of the mode of action of flame retardant. Factors affecting flame retardancy. Essential requirements of a good flame retardant. Various flame retardant finishes for cotton, wool, silk, jute & hemp, Tests for flame proof and flame retardancy.

CHAPTER – V – Anti Microbial Finishing

Object, requirements, types of anti microbial finishing. Mechanism of anti microbial finishing. Desirable properties of a good anti microbial finishes, Various anti microbial finishes for cotton, wool, silk, PET, Nylon and Acrylic. Tests for anti microbial finishes.

CHAPTER – VI – Softeners

Desirable properties and various classes of softeners, Properties, mode of action and application of cationic, anionic, Non-ionic, reactive and emulsion type softeners. Softeners for cotton, wool, silk, jute, polyester and acrylic. Comparison of various softeners.

CHAPTER – VII – Soil Release Finishing

Type of soils, mechanism of soil impingement and soil retention. Mechanism of soil release. Soil release finishing of cotton, wool, silk, synthetics, Jute & hemp, tests for soil release finishes.

CHAPTER – VIII – Finishing of Silk & Wool

Tin weighting of silk, various mechanical and chemical finishes for silk. Various mechanical and chemical finishing of wool. Mechanism of setting of wool, concept of wet setting of wool.

CHAPTER – IX – Finishing of Bast Fibroux Goods

Woollenization of Jute. Various finishing of Jute, hemp, liner etc. Concept of value addition finishes for jute & hemp.

CHAPTER – X – Special Finishes

Waterproof and water repellent finishing, Mildewproof and rotproof finishing. Organdie finishing, Mechanical and chemical inishing of Denim and Knit goods, Biopolishing.

CHAPTER – XI –

Finishing of readymade garments, finishing recipes for 100% cotton, wool, silk, jute, hemp etc. Problems and remedies in finishing

LIST OF EXPERIMENTS

1. Preparation and application of Blue Tone and Red Tone on cellulosic.
2. Preparation and application of Blue Tone and Red Tone on synthetic and its blends.
3. Finishing of cotton for imparting soft, medium and stiff handle.
4. Application of OBA on cotton and silk by continuous & exhaust method.
5. Finishing of wool to impart moth proofing & flame retardancy.
6. Finishing of Silk to impart crease recovery property, soil release & softness.
7. Finishing of Jute.
8. Application & evaluation of anti microbial finish on cotton.
9. Application & evaluation of soil release finishing on cotton.
10. Application & evaluation of flame retardant finishing on cotton.
11. Application & evaluation of waterproof / Water repellent Finishing on cotton
12. Application & evaluation of various type of softeners on cotton.

REFERENCE BOOKS

- 1) Chemical after treatments of textile by Marks, Atlas & Wooding.
- 2) Textile finishing by A.J. Hall.
- 3) Introduction to textile finishing by J.T. Marsh.

- 4) Technology of finishing – Vol. X by Dr. V.A. Shenai.
- 5) Chemical processing of polyester/cellulosic blends by R.M. Mittal and S.S. Trivedi.
- 6) Silk dyeing, printing and finishing by Prof. M.L. Gulrajani.

THIRD YEAR B.TEXT. – SEMESTER-I

5.5 CHEMICAL ENGINEERING OPERATIONS (TC)

Lectures	:	3 Hrs / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

1) Introduction to the unit operations of chemical engineering. Difference between unit operations & unit processes. Definition & classification of mass transfer operations, Definition & classification of diffusion and diffusional mass transfer operations. Fick's laws of diffusion. The concepts of diffusion rate, diffusion co-efficient & diffusivities.

Relevance of mass transfer studies to textile industry in general & its chemical processing sector in particular. Brief study of diffusion in gas phase, liquid phase & diffusion through solids.

2) Study of different unit operations of chemical engineering like distillation, extraction, absorption, adsorption, evaporation, crystallization with respect to their concept, principle of separation, types, performance analysis & applications from textile industry view point.

3) Brief study of the operational procedures of different textile processing machines like pressurized vessel for dyeing, open vessel for dyeing, continuous range chemical processing machines, heat exchangers, evaporators, water treatment plants etc. in reference to the actual occurrence of different unit operations of chemical engineering.

4) Definition & examples of simultaneous heat & mass transfer operations. Drying as an example of such kind. Definition, principles & purposes of drying. Heat & mass balance of drying operation. Heat capacities of textile materials. Theory of drying. Relevance of drying to textile industry. Brief study of various textile dryers like drum dryer, tumble dryer, stenters, study of new drying

techniques like IR, RF drying. Numericals based on drying operations related to textile processing industry.

5) Study of membrane separation operations. Types of membranes, Merits of these operations over the conventional mass-transfer operations. Brief study of the membrane technologies like reverse osmosis, dialysis, electro-dialysis, ultra-filtration, micro filtration with respect to their principle of operation, separation size range, rate expressions and applications in general.

The applications of these membrane separation operations to the cheming processing sector of textiles. Simple numericals based on above.

6) Brief introduction to mechanical operations. Definition of size reduction operations, only classification of size reduction equipments. Concept of crushing efficiency. Study of different laws of crushing & grinding. Applications of the size reduction operations to the dyestuff making as well as dyestuff using industries like textiles. Brief study of a ball mill.

7) Importance of the screening of size reduced materials. Study of particle size, particulate matter. Introduction to sieve analysis. Screen efficiency, screen effectiveness. Simple numericals based on above.

Brief study of mixing operation. Need of liquid mixing in chemical processing of textiles. Only classification of mixing equipments. Brief study of mixing performance analysis.

8) Introduction to filtration operation. Study of filter media, filter aids, various types of filters used in textiles, advantages & uses of filtration operation. Applications of filtration operation to textile industry's wet processing sector. Brief study of filtration equipments. Simple numericals of based on rate of filtration.

Definition and need of settling processes. Types and applications of settling process in reference to textile chemical processing industry.

REFERENCE BOOKS

- 1) 'Mass Transfer Operations' by Treybal, McGrawHill publication. (1955)
- 2) 'Introduction to Chemical Engineering', by Badger and Banchemo, McGraw Hill publication (1955)
- 3) Transport Phenomena by Beek and Muttzall, Byron Bird R., Wiley publication. (1975).
- 4) 'Theory of Coloration of Textiles' by Bird and Boston, Dyers Company Publications Trust, (1975).

- 5) The Physical Chemistry of Dyeing, Volume-III, by R.H. Peters, Elsevier publication (1975).
- 6) 'Chemical Engineers' Handbook, by Perry, McGraw-Hill publication.
- 7) 'Unit Operations in Environmental Engineering' by R. Elangovan, M. K. Saseetharan, New Age International (P) Ltd., Publishers.
- 8) 'Coulson & Richardson's Chemical Engineering' Volumes 1-6, Asian Books Pvt. Ltd.,

THIRD YEAR B. TEXT - SEMESTER-I

5.6 PHYSICAL CHARACTERISTICS OF TEXTILE FIBRES (TC)

Lectures	:	3 Hrs / Week
Theory Paper	:	100 Marks
Subject Total	:	100 Marks

1. Fibre structure-Requirements of fibre formation- molecular weight and degree of polymerisation-useful limits of polymerization- crystalline and amorphous regions-molecular structure of fibres-morphological models-one phase, two phase, three phase models,-morphology of various fibres.
2. Techniques for investigation of fiber structure
 - a. Optical properties of textile fibres- Refractive Index- Double refraction, Birefringence. Optical heterogeneity in fibres-The factors influencing the birefringence of a fibre, Measurement of birefringence -the beckeline method-compensator method-interference microscopy- refractometer method-Significance of birefringence, Optical dichroism and its importance
 - b. X-ray Diffraction Investigations-Introduction, Production and origin of X-rays-Bragg's law of x-ray diffraction-crystal structure-miller indices-determination of fibre structural parameters by x-ray diffractometer and fibre diagram techniques, small angle scattering
 - c. Electron Microscopy –Principle of electron microscope- Transmission and scanning electron microscopes and their principle, working and applications
 - d. Infrared Spectroscopy –Spectroscopy, Beer-Lambert law, Principles of IR-Spectroscopy, Principle and working of IR spectrophotometer, Applications, IR-Dichroism and its importance.
3. Mechanical Properties of Textile fibres
 - a. Tensile properties Terminology, the factors influencing the tensile properties of fibres

- b. Elastic recovery-Definitions-Effects of test conditions on elastic recovery of fibres- Mechanical conditioning of fibres-swelling recovery
 - c. Forces in various directions-bending and twisting of fibres, derivation of flexural and torsional rigidity, shear modulus-shear strength-general elastic deformation-compression
 - d. Theories of Mechanical Properties-approaches-structural effects in fibres-theories of time dependence-thermodynamic effects, Boltzmann superposition principle, WLF equation, creep stress relaxation, stress-strain curve, dynamic mechanical properties, their measurement and importance, factors influencing them.
4. Model theory of viscoelasticity-linear viscoelasticity, viscoelastic models- Features of Eyring model, iso-stress, iso strain & Takayanagi model.
5. Moisture relations and testing –
Regain and moisture content – Measurement of atmospheric conditions – Control of testing room atmosphere, Regain – humidity relationships, Effects of regain on fibre properties.
The measurement of regain – correct invoice weight – moisture testing ovens – rapid drying oven – Drying by means of chemical ovens – Drying by hot air-currents – Drying by radio frequency wave – Regain measurement by methods based on resistance and capacitance principles.
6. Thermal properties-Introduction-Specific heat capacity, thermal conductivity, structural changes in fibres on heating and setting, Transition in fibres-primary and secondary transitions and their significance, factors influencing them, degradation and decomposition, Thermal expansion of fibres. Principle, working & applications of DSC, DTA, DMA.
7. Electrical properties: Static electricity-its generation and consequences measurement of static electricity, Dielectric properties-permittivity, dielectric constant, dissipation factor, power factor, factors influencing the dielectric properties, measurement of dielectric behavior of fibres, Electric resistance-

Specific resistance- Measurement of resistance-Factors influencing the electrical resistance of fibres.

REFERENCE BOOKS

1. Fibre Science- Edited by J.M. Preston, Published by the textile institute, Manchester
2. Physical Methods of Investigation of Textiles, Edited by Meredith R. and Hearle J.W.S.-Published by Textile Book published Inc. New York
3. Physics of fibres- An Introductory Survey-Woods H. J. Published by the Institute of Physics-London, 1955
4. Applied Fibre Science- Vol I-Edited by F. Happey published by Academic Press, London
5. Physical Properties of Textile Fibres-Morton W. E. and Hearle J.W.S. published by the Textile Institute Manchester
6. Fibre Microscopy-Stores J. L. published by London National Trade Pr
7. Structure/Property relationship in Textile Fibres-Textile Progress Vol. 20 No. 4 The Textile Institute Manchester
8. Textile Fibres Yarns and Fabrics – Kaswell E. R. published by Reinhold Publishing Corporation- New York, 1954

T.Y.B.TEXT. (TC) SEMESTER-II

SR. NO.	COMMITTON TO COURSES	SUBJECTS	TEACHING SCHEME				EXAMINATION SCHEME				
			L	T	DR	PR	TP	TW	OE	PE	SUB. TOTAL
6.1	TT/MMTT/TPE/TC	ADVANCED COMPUTER PROGRAMMING	3	---	---	2	100	50	---	50	200
6.2	TC	TECHNOLOGY OF DYEING-II	3	---	---	3	100	---	---	50	150
6.3	TC	TECHNOLOGY OF PRINTING-II	3	---	---	3	100	---	---	50	150
6.4	TC	TECHNOLOGY OF FINISHING-II	3	---	---	3	100	50	---	---	150
6.5	TC	TEXTILE PROCESS PLANNING & MANAGEMENT	4	---	---	---	100	50	---	---	150
6.6	TC	PROCESS CONTROL & SAFETY IN CHEMICAL PROCESSING	3	---	---	---	100	---	---	---	100
			19	---	---	11	600	150	---	150	900
L =LECTURES T =TUTORIALS DR=DRAWING PR=PRACTICALS			TP=THEORY PAPER TW=TERM WORK OE=ORAL EXAMINATION PE=PRACTICAL XAMINATION								

THIRD YEAR B.TEXT. SYLLABUS - SEMESTER - II

6.1 **ADVANCED COMPUTER PROGRAMMING (TT/MMTT/TPE/TC)**

Lectures	-	3 hrs/week.
Practicals	-	2 hrs/week.
Theory Paper	-	100 marks.
Term Work	-	50 Marks
Practical Exam.	-	50 marks.
Subject Total	-	200 marks.

1. Introduction to Windows:

Managing windows, working with disks, folders and files, finding lost files, creating backups, shortcut keys, installing and removing programmes, printing in windows, printer setting, fonts, installing fonts.

2. Networking Concepts:

Introduction to network, use of computer networks, network topologies, network types – LAN, MAN, WAN, network hardware components – cables, connectors, NIC, Hub, Switch etc. Network operating system, client/server architecture, Internet and its applications.

3. Database Management:

Introduction to database, records, Relational database management systems, structural query languages (SQL), SQL commands – Select, Insert, update, delete, joins – inner join, outer join, equijoin.

4. Visual Basic Fundamentals:

Introduction, projects in visual basic, project explorer, setting project options, Visual Basic code – understanding procedures, subroutines, functions, comments, code window & its features, controlling program flow, conditional branching, loops.

5. Visual Basic Data Types:

Data types in visual basic, - byte, Integer, long, single, double, currency, Boolean, data, string, object, variant, declaring variables, variable scope &

life time, data conversion, arrays, constants, user defined data types.

6. Designing User Interface:

Forms, form properties, form events, loading, unloading, showing & hiding forms controls in visual Basic – label, buttons, text box, list, dropdown selection list, checkbox, option button, timer control, setting tab order, manus in visual basic.

7. Dialogs:

Introduction, message box, input box, common dialog.

8. Programming Database Access :

Introduction, Record set object – definition, properties, methods & events, records, working with record set in code, visual basic data control, Introduction to ADO.

LIST OF EXPERIMENTS

1. Study of Windows 98 operating system.
2. Working with Start Button, Desktop, Explorer, Control Panel.
3. Study of network System with commands from Novell Network.
4. Creating databases, tables using Ms-access.
5. Working with SQL Commands like Select, Insert, Update, Delete, etc.
6. Creating simple form in Visual Basic.
7. Writing applications in Visual Basic using multiple forms, various controls (like radio button, list etc.) and database application using data control for
 - ◆ Finding mean, SD, CV% of yarn strength testing machine
 - ◆ Finding twist & its SD, mean & CV%
 - ◆ To calculate production of winding m/c, warping m/c, sizing m/c, looms, (Weaving Machine.), blow room, card, speed frame, ring frame etc (Spinning Machine).
 - ◆ Finding % exhaustion of dye bath.

- ◆ Finding correlation between whiteness & strength.
- ◆ Finding at add on of finish.

REFERENCE BOOKS

1. Windows 95 for busy people – Ron Mansfield (Tata McGraw-Hill Edition)
2. Computer Guide to Networking – Peter Norton (Techmedia publication)
3. Computer Networks (Third Edition)
4. SQL for professional – Swapna Kishore, Rajesh Naik (Tata McGraw-Hill editon)
5. Guide to Visual Basic 6 – Peter Norton (Techmedia Publication)
6. Beginning Visual Basic 6 – Peter Wright (WROX Publication)

THIRD YEAR B. TEXT - SEMESTER-II
6.2 TECHNOLOGY OF DYEING - II (TC)

Lectures	:	3 Hrs / Week
Practicals	:	3 Hrs / Week
Theory Paper	:	100 Marks
Practical Exam.	:	50 Marks
Subject Total	:	150 Marks

- 1. Mass Colouration & Tow Dyeing:** - Mass colouration of polyester & Nylon with methods colour addition in polymerization, chips coating, Master batch addition, chips dyeings & Injection during Melt Spinning, Mass colouration of acrylic fibre, Tow dyeing of polyester and acrylic. Advantages & limitations of mass colouration.
- 2. Theory of Dyeing with Disperse Dye:-** Disperse dyes, dispersions, Dye solubility, size of particles, theory of cellulose acetate dyeing mechanism, Affinity, Temperature influence, Influence of Heat Treatment influences, Polyester dyeing mechanism, Dyeing in vapour phase, Dyeing kinetics with disperse dyes. Dyeing with carriers.
- 3. Polyester Dyeing:-** Preparation of fabric for dyeing, Carrier dyeing of Polyester, Industrial practices of carrier dyeing, Advantages and limitations of carrier dyeing, High temperature dyeing process, HT dyeing equipments, Effects of different auxiliaries, Control & rectification of various problems in High temperature dyeing, Oligomers Problem. Thermo fixation Process – Preparation of fabric for dyeing, Preparation of pad liquor, Padding & dyeing, Thermotixatron equipments required for dyeing. Dyeing of micro denier polyester, CDPET & texturised polyester.
- 4. Nylon Dyeing:-** Dyeing theory of Nylon, Dyeing with acid and metal complex dyes, leveling agents, swelling agents, High & low temp. dyeing, dyeing with disperse & reactive dyes. Faults and remedies in Nylon Dyeing.

5. **Acrylic Dyeing:-** Preparation of acrylic for dyeing. Dyeing of acrylic fibre, yarn and fabric, Effect of different parameters on dyeing. Effect of different auxiliaries in dyeing. Defitherm process. Dyeing of acrylic with disperse dyes. Stripping of cationic dyes.
6. **Dyeing of Other Synthetic Fibres:-** Dyeing of cellu-acetate & tri acetate, dyeing of modified & unmodified polypropylene, Dyeing of PVA, PVC & polyurethane Fabrics.
7. **Dyeing of Various Blends:-** Batch and continuous dyeing process of poly / cellulose blends, Dyeing of poly / wool, polyester / Acrylic, Polyamide / Wool, Acrylic / Wool, Acrylic / Silk, Dyeing with one colour & two colour synthetic fibre blends Polyamide / acrylic, Dyeing of polyester / modified polyester blend, polyester / Lycra, Acrylic / cellulosic.
8. **Dyeing of special Fabric:-** Dyeing of Knitted goods, Garment dyeing, Terry Towel dyeing, Processing of top dyed goods, Dyeing of Denim Fabric.

LIST OF EXPERIMENT

1. Dyeing of polyester yarn in package dyeing machine with the computerized recipes and evaluation of colour difference, sublimation fastness and light fastness and metamerism.
2. Dyeing of polyester fabric in H. T. Beaker dyeing machine with the computerized recipes and evaluation of colour difference, sublimation fastness and light fastness and metamerism.
3. Dyeing of P/C blended shirting using disperse / reactive system by exhaust method with the computerized recipes and evaluation of colour difference, sublimation fastness and light fastness and metamerism.
4. Dyeing of P/C blended shirting using disperse / vat system by exhaust method with the computerized recipes and evaluation of colour difference, sublimation fastness and light fastness and metamerism.
5. 100% polyester dyeing by thermosol method with the computerized recipes and evaluation of colour difference, sublimation fastness and light fastness and metamerism.

6. Dyeing of P/C blended shirting with disperse / reactive method by continuous method with the computerized recipes and evaluation of colour difference, sublimation fastness and light fastness and metamerism.
7. Dyeing of P/C blended shirting with disperse / vat method by continuous method with the computerized recipes and evaluation of colour difference, sublimation fastness and light fastness and metamerism.
8. Dyeing of P/V blend shirting using disperse / reactive by two bath method.
9. Dyeing of P/V blend shirting using disperse / reactive by one bath method.
10. To study the effect of variation in flow rate of dye liquor, package density, winding geometry, in dyeing of polyester yarns in package form.
11. To study the effect of dispersing agent, levelling agent, defoming agent and rate of heating / cooling, fabric speed in dyeing of polyester.
12. Dyeing of polyester / acrylic, polyester / wool blend.

REFERENCE BOOKS

1. Textile processing & properties by Tyrone L. Vigo
2. Processing of poly/cotton blends by G. G. Kulkarni & S. S. Trivedi
3. Dyeing of polyester & its blends by Prof. M. L. Gulrajani
4. Chemical processing of synthetic fibres by Dr. K. V. Datya & A.A. Vaidya
5. Technology of dyeing by Dr. V. A. Shenai
6. Chemical technology in the pre treatment process of textile by Dr. S. R. Karmakar.

THIRD YEAR B.TEXT. – SEMESTER-II

6.2 TECHNOLOGY OF PRINTING-II (TC)

Lectures	:	3 Hrs / Week
Practicals	:	3 Hrs / Week
Theory Paper	:	100 Marks
Practical Exam.	:	50 Marks
Subject Total	:	150 Marks

Printing of Polyester

Preparations of 100% polyester fabric for printing, paste formulation, selection criteria of dyes, chemistry and mechanism of various discharging and resisting agents used in printing. Direct, discharge and resist styles of printing on 100% polyester. Shopfloor practices, problems & remedies in printing,

Printing of Polyester & their Blends

Printing of P/C blended fabric, single dye applications and blended fabrics. Fluorescent pigments, selection criteria for binders, synthetic binders, pigment printing of polyester and P/C blended fabrics.

Printing of Polyamides

Preparation of Nylon fabric for printing, paste formulations, printing of nylon with acid, metal complex and disperse dyes. Shopfloor practices, problems & remedies in nylon printing

Printing of Silk and Wool

Preparation of silk and wool fabric for printing, paste formulations, printing of silk & wool with acid, metal complex & reactive dyes, printing with natural dyes.

Transfer Printing

Concept of transfer printing, selection of paper, ink and dyes for transfer printing, Introductions of machinery used for printing paper and machinery used for transfer printing.

Foam Printing

Concept of foam and its applications in foam printing.

Brasso Printing

Concept of Brasso style of printing, paste formulations, commercial practices, problems remedies in Brasso printing, Carbonized prints.

Carpet Printing

Concept of carpet printing & study of machinery used for carpet printing.

LIST OF EXPERIMENT

1. Direct style of printing on 100% polyester by using disperse dyes.
2. White discharge style of printing by using stannous chloride and Rongalite C.
3. Coloured discharge style of printing on polyester using stannous chloride & Rongalite C
4. Resist style of printing using Cupric Acetate on polyester.
5. Brasso style of printing on P/C blends.
6. Transfer printing on polyester.
7. Printing of silk with acid and basic dyes.
8. Printing of wool with metal complex dyes.
9. Printing of P/C blended sarees by using disperse / reactive dye.
10. Printing of P/C blended sarees by using disperse / vat dye.
11. Visit to printing unit.

REFERENCE BOOKS

- 1) Technology of printing by Dr . V. A. Shenai
- 2) An introduction to textile printing by W Clarke.
- 3) Textile Printing by L.W.C. Miles.
- 4) Textile Printing Book of papers by Prof. R.B. Chavan.
- 5) Processing of silk by Prof. M.L. Gulrajani.
- 6) Proceedings: Recent advances in Textile Processing lectures/seminar, Dec.1982, I.I.T., Delhi.
- 7) Colourage, ITB International bulletin on dyeing printing & finishing.

THIRD YEAR B.TEXT. - SEMESTER - II

6.4 TECHNOLOGY OF FINISHING-II (TC)

Lectures	-	3 hrs/week.
Practicals	-	3 hrs/week.
Theory Paper	-	100 marks.
Term Work	-	50 marks
Subject Total	-	150 marks.

1. Setting :-

Objects, types of setting. Mechanism of temporary set and permanent set, Structural changes brought about by heat setting. Concept of grey intermediate and post heat setting. Heat Setting conditions of various yarns and fabrics. Industrial practices of heat setting of polyester and its blends. Various methods to determine the degree of heat setting.

2. Antipilling Finishing :-

Causes of pill formation. Factors affecting pilling tendency. Various physical and chemical methods to reduce pilling. Evaluation of efficiency of antipilling finishing.

3. Spin Finishing :-

Object of spin finish. Concept of Turbo electric series and its importance. Spin finishing ingredients and their functions. Various methods of application of spin finishes. Spin finishing of various materials. Spin finishing of Textured polyester. Antistatic finishing.

4. Optical Brightening Agent :-

Mechanism of whitening action. Concept of saturation and subjective brightness, whitening with a blueing agent, Essential requirements of a good OBA. Chemical classes of OBA. Methods of application of OBA. OBA suitable for cotton, wool, silk, jute. Removal of OBA. Chemistry of OBA suitable for synthetics. Methods of application of OBA on synthetics. OBA suitable for PET, Acrylic, Nylon and Polypropylene.

5. Special finishes :-

Silk like polyester, Antistatic finishing. Finishing of microdenier polyester goods. Soil release finishing of synthetic and its blends.

6. Minimum application techniques & energy conservation :-

Various Minimum application techniques.

Foam Finishing :- Concept of foam and blow ratio. Properties of foam, Factors affecting the stability of foam. Methods to determine the stability of foam. Disperse and condensation methods of preparation of foam. Various techniques of foam application. Drawbacks of foam finishing. Various approaches for Energy Conservation and cost reduction in finishing.

7. Finishing recipe for 100% PET, polyester/cellulosic blends, P/W blend, etc. Finishing of 100% polyester, polyester/cotton, polyester/viscose, polyester/wool, Acrylic & its blends, nylon & its blends, cotton/lycra blends.

8. Modern evaluation methods like KAWABATA and FAST system. Recent developments in finishing like nano finish, micro-encapsulation. Introduction to finishing of technical textiles.

LIST OF EXPERIMENTS

- 1) Application of OBA on polyester, nylon & acrylic,
- 2) Finishing of polyester material for imparting soft, medium & stiff handle.
- 3) Finishing of 100% polyester suiting.
- 4) Finishing of carbonized goods.
- 5) Finishing of 100% polyester shirting.
- 6) Finishing of polyester / cellulosic blend.
- 7) Finishing of polyester / wool blend.
- 8) Application of softeners on synthetic goods.
- 9) Antimicrobial finishes for polyester nylon & acrylic.
- 10) Setting of various materials.
- 11) Weight reduction to produce silk like polyester.
- 12) Fragrance finish by micro encapsulation.

REFERENCE BOOKS

- 1) Chemical processing of synthetic and its blends by Dr. K.V. Datye and A.A. Vaidya.
- 2) Low liquor dyeing and finishing – The Textile Institute, Manchester.
- 3) Chemical after treatments of textiles by Marks, Atlas and wooding.
- 4) Textile Finishing by A.J. Hall.
- 5) Chemical processing of polyester/cellulosic blends by R.M. Mittal and S.S. Trivedi.
- 6) Technology of Finishing Vol. X, by Dr. V.A. Shenai.

THIRD YEAR B.TEXT. – SEMESTER-II

6.5 TEXTILE PROCESS PLANNING & MANAGEMENT (TC)

Lectures	-	4 hrs. / week
Theory Paper-		100 Marks
Term Work	-	50 Marks
Subject Total	-	150 Marks

- 1) **General :-**
 - Objectives of dyehouse
 - Structure of the organization.

- 2) **Management :-**
 - Various management techniques
 - Principle & functions of management.
 - Role of HRD in management
 - Concept of ISO
 - Inventory control

- 3) **Layout :-**
 - Study of layout plan of existing process house.
 - Ideal plan of layout for modern process house for 100% cotton, polyester & its blends, yarn dyeing knit process.

- 4) **Setting up of modern process house:-**
 - Selection of location.
 - Selection of site.
 - Construction of building for modern process.

- 5) **Norms for machine production:-**
 - Norms of production for shearing & cropping, singeing, kier.
 - Norms of production for jiggers, jet dyeing machines.
 - Norms of production for flat bed & rotary screen printing m/c.
 - Norms of production for heat setting & other finishes.
 - Norms of production for CBR & CDR m/c.

6) Consumption of Water:-

- Quality of water requirement for ideal process house.
- Consumption of water in pretreatment.
- Consumption of water in jigger, jet dyeing m/c.
- Consumption of water in CBR & CDR.
- Measures to reduce water consumption.

7) Consumption of thermal energy:-

- Various fuels used in process houses.
- Form of energy requirement.
- Consumption of energy in wet processing.
- Consumption of energy in dyeing.
- Consumption of energy in printing.
- Consumption of energy in finishing.
- Measures to reduce the energy consumption.

8) Lighting requirement:-

- Work place & norms of lighting.
- Position of lighting.

9) Costing:-

- Principles of costing
- Classification of costing.
- Chemical costing per kg. in pre treatment
- Chemical costing per kg. in dyeing of jigger / jet.
- Chemical costing per kg. in printing.
- Chemical costing per kg. in finishing.

10) Material Handling:-

- Goals of material handling.
- Material handling & plant layout.
- Material handling equipments.

11) Quality aspects:-

- Concept of R & D. in process house.
- Quality assurance department & their functions.
- Production planning department (PPD) their functions.

TERM WORK

- 1) Preparation of layout plan & machinery layout for
 - a. Package dyeing unit.
 - b. 100% cotton woven goods processing.
 - c. Synthetic and / or blend processing.
 - d. Knit goods processing.
- 2) Preparation of project report for modern process house.

REFERENCE BOOKS

- 1) Dyehouse management manual by James Park & John Shore
- 2) Plant-layout and material handling by Fred E. Meyers.
- 3) Management of Textile Industry by V.D. Dudeja.
- 4) Management perspectives in textile industry – BTRA.
- 5) Textile Manufacturing by M.G. Kulkarni.
- 6) PMR's Textile laws & Policy by Somesekhar B.V. & Dr.Raj Mogili A.

THIRD YEAR B.TEXT. – SEMESTER-II

6.6. PROCESS CONTROL & SAFETY IN CHEMICAL PROCESSING (TC)

Lectures	-	3 hrs. / week
Theory Paper-		100 Marks
Subject Total -		100 Marks

- 1. General :-**
 - Definition of process & quality control
 - Necessity of process control
 - Approach towards process control.
 - Definition of quality
 - Importance of kaizen & bench marking.
 - Importance of ISO 9000 series.
- 2. Quality Control / Assurance :-**
 - Importance of quality assurance.
 - Structure & functions of quality assurance department.
- 3. Process Control in Pretreatment :-**
 - Process control parameters for singeing, desizing, scouring, bleaching, mercerizing and continuous bleaching range.
 - Norms for the above stages of pretreatments.
 - Problem & remedies in pretreatments.
- 4. Process Control in Dyeing :-**
 - Process control parameters for jiggers, padding mangles, jet dyeing m/c., package dyeing m/cs., soft flow dyeing m/cs. and continuous dyeing range.
 - Measures to achieve RIGHT FIRST TIME dyeings.
 - Problem & remedies in dyeing.
- 5. Process Control in Printing :-**
 - Process control parameters for Flat bed screen printing m/c., rotary screen printing m/c, steamers, curing m/c.
 - Problem & remedies in printing.

6. Process Control in Finishing :-

- Process control parameter for stenters, sanforising, calendars, Drying range.
- Problem & remedies in finishing.

7. Quality Control in Bleaching

Various Testing methods like –

- Whiteness
- Ash content
- Barium activity number
- Axial Ratio
- Carboxyl group content.
- Copper number
- Weight loss
- Fluidity
- Norms for the above testing of bleaching & mercerizing process.

8. Quality control in dyeing and printing -

Various testing methods like –

- Light
- Washing
- Rubbing
- Sublimation.
- Perspiration
- Norms for the above testing of dyeing & printing.

9. Quality control in finishing -

Various testing methods like –

- Iodine absorption.
- Crease recovery angle
- Bending length
- Tensile strength
- Water permeability.

- Water proof.
- Norms for the above testing of finished methods. .

10. Accidents -

- Factors responsible for accidents in textile mills.
- Factors affecting health or safety of workers or health hazards like Flooring, machinery, lighting, drainage, maintenance, material handling, plant – layout, storage transport.

11. Safety -

- Electrical safety
- Use of safety aids & on site emergency safety plans.
- Different chemicals used in wet processing, their safe norms, safe handling & safety measurement.

12. Safety Plan -

- Role or fire hazards identification & their separation.
Participation of management & workers for safety plan.

REFERENCE BOOKS

1. Testing and Quality Management – Vol.-I by Dr.V.K. Kothari IAFL Publication, S-351, Greater Kailash Part-I, New Delhi.
2. Norms for the textile industry Part-III – booklet published by ATIRA, Ahmedabad.
3. Norms in textile industry – ATIRA, BTRA, SITRA, NITRA.
4. Industrial quality by Lawrence S. Aft published by St. Lucie Press, Washington D.C.
5. Industrial Safety and Control Handbook, published by National Safety council & Associate (Data) Publishers Pvt. Ltd.,
6. Occupational safety and health in the textile industry by textile committee.
7. Occupational health and safety by Dr. V.A. Shenai.