

**AFFILIATED INSTITUTIONS**  
**ANNA UNIVERSITY, CHENNAI**  
**R - 2008**  
**B.TECH. TEXTILE CHEMISTRY**  
**II – VIII SEMESTERS CURRICULA AND SYLLABI**  
**SEMESTER II**

(Common to all B. E. / B. Tech. Degree Programmes except B. E. – Marine Engineering)

SL. No.	COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>						
1.	HS2161	<u>Technical English – II*</u>	3	1	0	4
2.	MA2161	<u>Mathematics – II*</u>	3	1	0	4
3.	PH2161	<u>Engineering Physics – II*</u>	3	0	0	3
4.	CY2161	<u>Engineering Chemistry – II*</u>	3	0	0	3
5. a	ME2151	<u>Engineering Mechanics</u> <b>(For non-circuit branches)</b>	3	1	0	4
5. b	EE2151	<u>Circuit Theory</u> <b>(For branches under Electrical Faculty)</b>	3	1	0	4
5. c	EC2151	<u>Electric Circuits and Electron Devices</u> <b>(For branches under I &amp; C Faculty)</b>	3	1	0	4
6. a	GE2151	<u>Basic Electrical &amp; Electronics Engineering</u> <b>(For non-circuit branches)</b>	4	0	0	4
6. b	GE2152	<u>Basic Civil &amp; Mechanical Engineering</u> <b>(For circuit branches)</b>	4	0	0	4
<b>PRACTICALS</b>						
7.	GE2155	<u>Computer Practice Laboratory-II*</u>	0	1	2	2
8.	GS2165	<u>Physics &amp; Chemistry Laboratory - II*</u>	0	0	3	2
9. a	ME2155	<u>Computer Aided Drafting and Modeling Laboratory</u> <b>(For non-circuits branches)</b>	0	1	2	2
9. b	EE2155	<u>Electrical Circuits Laboratory</u> <b>(For branches under Electrical Faculty)</b>	0	0	3	2
9. c	EC2155	<u>Circuits and Devices Laboratory</u> <b>(For branches under I &amp; C Faculty)</b>	0	0	3	2
<b>TOTAL : 28 CREDITS</b>						
10.	-	<u>English Language Laboratory</u> <sup>+</sup>	0	0	2	-

## **A. CIRCUIT BRANCHES**

### **I Faculty of Electrical Engineering**

1. B.E. Electrical and Electronics Engineering
2. B.E. Electronics and Instrumentation Engineering
3. B.E. Instrumentation and Control Engineering

### **II Faculty of Information and Communication Engineering**

1. B.E. Computer Science and Engineering
2. B.E. Electronics and Communication Engineering
3. B.E. Bio Medical Engineering
4. B.Tech. Information Technology

## **B. NON – CIRCUIT BRANCHES**

### **I Faculty of Civil Engineering**

1. B.E. Civil Engineering

### **II Faculty of Mechanical Engineering**

1. B.E. Aeronautical Engineering
2. B.E. Automobile Engineering
3. B.E. Marine Engineering
4. B.E. Mechanical Engineering
5. B.E. Production Engineering

### **III Faculty of Technology**

1. B.Tech. Chemical Engineering
2. B.Tech. Biotechnology
3. B.Tech. Polymer Technology
4. B.Tech. Textile Technology
5. B.Tech. Textile Technology (Fashion Technology)
6. B.Tech. Petroleum Engineering
7. B.Tech. Plastics Technology

### SEMESTER III

COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
MA2211	<u>Transforms And partial Differential Equations</u>	3	1	0	4
GE2021	<u>Environmental science and Engineering</u>	3	0	0	3
CH3221	<u>Organic Chemistry</u>	4	0	0	4
TC3204	<u>Polymer Science</u>	3	1	0	4
TC3205	<u>Chemistry and Technology of Intermediates and Dyes</u>	3	1	0	4
TC3206	<u>Technology of Yarn and Fabric Manufacture</u>	3	1	0	4
<b>PRACTICALS</b>					
TC3208	<u>Textile Chemicals Analysis Laboratory</u>	0	0	3	2
TC3209	<u>Yarn and Fabric Manufacturing Laboratory</u>	0	0	3	2
TC3210	<u>Fibre Analytical Laboratory</u>	0	0	3	2
<b>TOTAL</b>		<b>19</b>	<b>4</b>	<b>9</b>	<b>29</b>

### SEMESTER IV

COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
MA3211	<u>Probability and Statistics</u>	3	1	0	4
TC3220	<u>Physical Chemistry</u>	3	0	0	3
TC3213	<u>Instrumentation and Micro Processors</u>	3	0	0	3
TC3214	<u>Preparation of Textiles for Coloration</u>	3	0	0	3
TC3215	<u>Physical Testing of Textile Materials</u>	3	0	0	3
TT3216	<u>Structure and Properties of Fibres</u>	3	0	0	3
<b>PRACTICALS</b>					
TC3218	<u>Wet Processing Preparation Laboratory</u>	0	0	3	2
TC3219	<u>Textile Physical Testing Laboratory</u>	0	0	3	2
<b>TOTAL</b>		<b>18</b>	<b>1</b>	<b>6</b>	<b>23</b>

### SEMESTER V

COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
TT3301	<u>Chemistry of Textile Auxiliaries</u>	3	0	0	3
TC3302	<u>Wet Processing Machinery</u>	3	0	0	3
TC3303	<u>Theory of Dyeing and Colour Physics</u>	3	0	0	3
TC3304	<u>Dyeing of Cellulosic Textiles-I</u>	3	0	0	3
TC3305	<u>Dyeing of Protein Textiles</u>	3	0	0	3
TC3306	<u>Technology of Printing- I</u>	3	0	0	3
<b>PRACTICALS</b>					
TC3308	<u>Dyeing of Cellulosic Textile Laboratory</u>	0	0	3	2
TC3309	<u>Dyeing of Protein Textile Laboratory</u>	0	0	3	2
TC3310	<u>Shade Matching and Quality Control</u>	0	0	3	2
GE3318	<u>Communication Skills Laboratory</u>	0	0	4	2
<b>TOTAL</b>		<b>18</b>	<b>0</b>	<b>13</b>	<b>26</b>

### SEMESTER VI

COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
TC3311	<u>Technology of Finishing</u>	3	0	0	3
TC3312	<u>Dyeing of Synthetic Textiles</u>	3	0	0	3
TC3313	<u>Dyeing of cellulosic Textiles-II</u>	3	0	0	3
TC3314	<u>Technology of Printing-II</u>	3	0	0	3
TC3315	<u>Engineering Economics</u>	3	0	0	3
	Elective I	3	0	0	3
<b>PRACTICALS</b>					
TC3317	<u>Dyeing of Synthetic Textile Laboratory</u>	0	0	3	2
TC3318	<u>Textile Printing Laboratory</u>	0	0	3	2
TC3319	<u>Textile Finishing Laboratory</u>	0	0	3	2
	<b>TOTAL</b>	<b>18</b>	<b>0</b>	<b>9</b>	<b>24</b>

### SEMESTER VII

COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
TC3401	<u>Water and Effluent Treatment and Pollution Control</u>	3	0	0	3
TC3402	<u>Textile Mill Management</u>	3	0	0	3
TC3403	<u>Instrumental Methods of Chemical Analysis</u>	3	0	0	3
TC3404	<u>Process and Quality control in Textile Wet Processing</u>	3	0	0	3
	Elective II	3	0	0	3
	Elective III	3	0	0	3
<b>PRACTICALS</b>					
TC3407	<u>Product Development Laboratory</u>	0	0	3	2
TC3408	<u>Problem Analysis and Case Studies in Wet Processing</u>	0	0	3	2
TC3409	Mini project	0	0	3	2
	<b>TOTAL</b>	<b>18</b>	<b>0</b>	<b>9</b>	<b>24</b>

### SEMESTER VIII

COURSE CODE	COURSE TITLE	L	T	P	C
<b>THEORY</b>					
TC3410	<u>Disaster Management</u>	3	0	0	3
	Elective IV	3	0	0	3
	Elective V	3	0	0	3
<b>PRACTICALS</b>					
TC3413	Project Work	0	0	12	6
	<b>TOTAL</b>	<b>9</b>	<b>0</b>	<b>12</b>	<b>15</b>

## LIST OF ELECTIVES

COURSE CODE	COURSE TITLE	L	T	P	C
<b>Elective – I</b>					
TC3001	<u>Chemical Processing of Man Made Textiles</u>	3	0	0	3
TC3002	<u>Eco-Friendly dyes, chemicals and Processing</u>	3	0	0	3
TC3003	<u>Fibre Reinforced Composites</u>	3	0	0	3
<b>Elective – II</b>					
TC3004	<u>Garment Manufacturing Technology</u>	3	0	0	3
TC3005	<u>Modern Printing Technology</u>	3	0	0	3
TC3006	<u>Analysis of Textile Chemicals</u>	3	0	0	3
<b>Elective – III</b>					
TC3007	<u>Technical Textiles</u>	3	0	0	3
TT2072	<u>Apparel Marketing and Merchandising</u>	3	0	0	3
TC3009	<u>Clothing Science and Product Engineering</u>	3	0	0	3
<b>Elective – IV</b>					
TC3010	<u>Nonwoven Fabrics and Specialty Fabrics</u>	3	0	0	3
TC3011	<u>Advanced Wet Processing Machinery</u>	3	0	0	3
TC3012	<u>Textured Yarn Technology</u>	3	0	0	3
TC3013	<u>Energy Management and Conservation in Textile Industry</u>	3	0	0	3
<b>Elective – V</b>					
GE3008	<u>Professional Ethics and Human Values</u>	3	0	0	3
TC3015	<u>Computer Applications in Textiles</u>	3	0	0	3
TC3016	<u>Knitting Technology</u>	3	0	0	3
TC3017	<u>Home Textiles</u>	3	0	0	3

**AIM**

To encourage students to actively involve in participative learning of English and to help them acquire Communication Skills.

**OBJECTIVES**

- To help students develop listening skills for academic and professional purposes.
- To help students acquire the ability to speak effectively in English in real-life situations.
- To inculcate reading habit and to develop effective reading skills.
- To help students improve their active and passive vocabulary.
- To familiarize students with different rhetorical functions of scientific English.
- To enable students write letters and reports effectively in formal and business situations.

**UNIT I****12**

Technical Vocabulary - meanings in context, sequencing words, Articles- Prepositions, intensive reading& predicting content, Reading and interpretation, extended definitions, Process description

**Suggested activities:**

1. Exercises on word formation using the prefix 'self' - Gap filling with preposition.
2. Exercises - Using sequence words.
3. Reading comprehension exercise with questions based on inference – Reading headings
4. and predicting the content – Reading advertisements and interpretation.
5. Writing extended definitions – Writing descriptions of processes – Writing paragraphs based on discussions – Writing paragraphs describing the future.

**UNIT II****12**

Phrases / Structures indicating use / purpose – Adverbs-Skimming – Non-verbal communication - Listening – correlating verbal and non-verbal communication -Speaking in group discussions – Formal Letter writing – Writing analytical paragraphs.

**Suggested activities:**

1. Reading comprehension exercises with questions on overall content – Discussions analyzing stylistic features (creative and factual description) - Reading comprehension exercises with texts including graphic communication - Exercises in interpreting non-verbal communication.
2. Listening comprehension exercises to categorise data in tables.
3. Writing formal letters, quotations, clarification, complaint – Letter seeking permission for Industrial visits– Writing analytical paragraphs on different debatable issues.

**UNIT III****12**

Cause and effect expressions – Different grammatical forms of the same word - Speaking – stress and intonation, Group Discussions - Reading – Critical reading - Listening, - Writing – using connectives, report writing – types, structure, data collection, content, form, recommendations .

**Suggested activities:**

1. Exercises combining sentences using cause and effect expressions – Gap filling exercises using the appropriate tense forms – Making sentences using different grammatical forms of the same word. ( Eg: object –verb / object – noun )

2. Speaking exercises involving the use of stress and intonation – Group discussions– analysis of problems and offering solutions.
3. Reading comprehension exercises with critical questions, Multiple choice question.
4. Sequencing of jumbled sentences using connectives – Writing different types of reports like industrial accident report and survey report – Writing recommendations.

#### **UNIT IV**

**12**

Numerical adjectives – Oral instructions – Descriptive writing – Argumentative paragraphs – Letter of application - content, format (CV / Bio-data) - Instructions, imperative forms - Checklists, Yes/No question form – E-mail communication.

#### **Suggested Activities:**

1. Rewriting exercises using numerical adjectives.
2. Reading comprehension exercises with analytical questions on content – Evaluation of content.
3. Listening comprehension – entering information in tabular form, intensive listening exercise and completing the steps of a process.
4. Speaking - Role play – group discussions – Activities giving oral instructions.
5. Writing descriptions, expanding hints – Writing argumentative paragraphs – Writing formal letters – Writing letter of application with CV/Bio-data – Writing general and safety instructions – Preparing checklists – Writing e-mail messages.

#### **UNIT V**

**9**

Speaking - Discussion of Problems and solutions - Creative and critical thinking – Writing an essay, Writing a proposal.

#### **Suggested Activities:**

1. Case Studies on problems and solutions
2. Brain storming and discussion
3. Writing Critical essays
4. Writing short proposals of 2 pages for starting a project, solving problems, etc.
5. Writing advertisements.

**TOTAL: 60 PERIODS**

#### **TEXT BOOK**

1. Chapters 5 – 8. Department of Humanities & Social Sciences, Anna University, 'English for Engineers and Technologists' Combined Edition (Volumes 1 & 2), Chennai: Orient Longman Pvt. Ltd., 2006. Themes 5 – 8 (Technology, Communication, Environment, Industry)

#### **REFERENCES**

1. P. K. Dutt, G. Rajeevan and C.L.N Prakash, 'A Course in Communication Skills', Cambridge University Press, India 2007.
2. Krishna Mohan and Meera Banerjee, 'Developing Communication Skills', Macmillan India Ltd., (Reprinted 1994 – 2007).
3. Edgar Thorpe, Showick Thorpe, 'Objective English', Second Edition, Pearson Education, 2007.

#### **Extensive Reading:**

1. Robin Sharma, 'The Monk Who Sold His Ferrari', Jaico Publishing House, 2007

#### **Note:**

The book listed under Extensive Reading is meant for inculcating the reading habit of the students. They need not be used for testing purposes.

**UNIT I            ORDINARY DIFFERENTIAL EQUATIONS            12**

Higher order linear differential equations with constant coefficients – Method of variation of parameters – Cauchy’s and Legendre’s linear equations – Simultaneous first order linear equations with constant coefficients.

**UNIT II            VECTOR CALCULUS            12**

Gradient Divergence and Curl – Directional derivative – Irrotational and solenoidal vector fields – Vector integration – Green’s theorem in a plane, Gauss divergence theorem and Stokes’ theorem (excluding proofs) – Simple applications involving cubes and rectangular parallelepipeds.

**UNIT III           ANALYTIC FUNCTIONS            12**

Functions of a complex variable – Analytic functions – Necessary conditions, Cauchy – Riemann equation and Sufficient conditions (excluding proofs) – Harmonic and orthogonal properties of analytic function – Harmonic conjugate – Construction of analytic functions – Conformal mapping :  $w = z+c$ ,  $cz$ ,  $1/z$ , and bilinear transformation.

**UNIT IV            COMPLEX INTEGRATION            12**

Complex integration – Statement and applications of Cauchy’s integral theorem and Cauchy’s integral formula – Taylor and Laurent expansions – Singular points – Residues – Residue theorem – Application of residue theorem to evaluate real integrals – Unit circle and semi-circular contour(excluding poles on boundaries).

**UNIT V            LAPLACE TRANSFORM            12**

Laplace transform – Conditions for existence – Transform of elementary functions – Basic properties – Transform of derivatives and integrals – Transform of unit step function and impulse functions – Transform of periodic functions.

Definition of Inverse Laplace transform as contour integral – Convolution theorem (excluding proof) – Initial and Final value theorems – Solution of linear ODE of second order with constant coefficients using Laplace transformation techniques.

**TOTAL : 60 PERIODS****TEXT BOOKS**

1. Bali N. P and Manish Goyal, “Text book of Engineering Mathematics”, 3<sup>rd</sup> Edition, Laxmi Publications (p) Ltd., (2008).
2. Grewal. B.S, “Higher Engineering Mathematics”, 40<sup>th</sup> Edition, Khanna Publications, Delhi, (2007).

**REFERENCES**

1. Ramana B.V, “Higher Engineering Mathematics”, Tata McGraw Hill Publishing Company, New Delhi, (2007).
2. Glyn James, “Advanced Engineering Mathematics”, 3<sup>rd</sup> Edition, Pearson Education, (2007).
3. Erwin Kreyszig, “Advanced Engineering Mathematics”, 7<sup>th</sup> Edition, Wiley India, (2007).
4. Jain R.K and Iyengar S.R.K, “Advanced Engineering Mathematics”, 3<sup>rd</sup> Edition, Narosa Publishing House Pvt. Ltd., (2007).

**UNIT I CONDUCTING MATERIALS 9**

Conductors – classical free electron theory of metals – Electrical and thermal conductivity – Wiedemann – Franz law – Lorentz number – Draw backs of classical theory – Quantum theory – Fermi distribution function – Effect of temperature on Fermi Function – Density of energy states – carrier concentration in metals.

**UNIT II SEMICONDUCTING MATERIALS 9**

Intrinsic semiconductor – carrier concentration derivation – Fermi level – Variation of Fermi level with temperature – electrical conductivity – band gap determination – extrinsic semiconductors – carrier concentration derivation in n-type and p-type semiconductor – variation of Fermi level with temperature and impurity concentration – compound semiconductors – Hall effect – Determination of Hall coefficient – Applications.

**UNIT III MAGNETIC AND SUPERCONDUCTING MATERIALS 9**

Origin of magnetic moment – Bohr magneton – Dia and para magnetism – Ferro magnetism – Domain theory – Hysteresis – soft and hard magnetic materials – anti – ferromagnetic materials – Ferrites – applications – magnetic recording and readout – storage of magnetic data – tapes, floppy and magnetic disc drives.

Superconductivity : properties - Types of super conductors – BCS theory of superconductivity(Qualitative) - High T<sub>c</sub> superconductors – Applications of superconductors – SQUID, cryotron, magnetic levitation.

**UNIT IV DIELECTRIC MATERIALS 9**

Electrical susceptibility – dielectric constant – electronic, ionic, orientational and space charge polarization – frequency and temperature dependence of polarisation – internal field – Clausius – Mosotti relation (derivation) – dielectric loss – dielectric breakdown – uses of dielectric materials (capacitor and transformer) – ferroelectricity and applications.

**UNIT V MODERN ENGINEERING MATERIALS 9**

Metallic glasses: preparation, properties and applications.

Shape memory alloys (SMA): Characteristics, properties of NiTi alloy, application, advantages and disadvantages of SMA

Nanomaterials: synthesis –plasma arcing – chemical vapour deposition – sol-gels – electrodeposition – ball milling - properties of nanoparticles and applications.

Carbon nanotubes: fabrication – arc method – pulsed laser deposition – chemical vapour deposition - structure – properties and applications.

**TOTAL : 45 PERIODS****TEXT BOOKS**

1. Charles Kittel ‘ Introduction to Solid State Physics’, John Wiley & sons, 7<sup>th</sup> edition, Singapore (2007)
2. Charles P. Poole and Frank J.Ownen, ‘Introduction to Nanotechnology’, Wiley India(2007) (for Unit V)

**REFERENCES**

1. Rajendran, V, and Marikani A, ‘Materials science’Tata McGraw Hill publications, (2004) New delhi.
2. Jayakumar, S. ‘Materials science’, R.K. Publishers, Coimbatore, (2008).
3. Palanisamy P.K, ‘Materials science’, Scitech publications(India) Pvt. LTd., Chennai, second Edition(2007)
4. M. Arumugam, ‘Materials Science’ Anuradha publications, Kumbakonam, (2006).

**AIM**

To impart a sound knowledge on the principles of chemistry involving the different application oriented topics required for all engineering branches.

**OBJECTIVES**

- The student should be conversant with the principles electrochemistry, electrochemical cells, emf and applications of emf measurements.
- Principles of corrosion control
- Chemistry of Fuels and combustion
- Industrial importance of Phase rule and alloys
- Analytical techniques and their importance.

**UNIT I ELECTROCHEMISTRY 9**

Electrochemical cells – reversible and irreversible cells – EMF – measurement of emf – Single electrode potential – Nernst equation (problem) – reference electrodes – Standard Hydrogen electrode – Calomel electrode – Ion selective electrode – glass electrode and measurement of pH – electrochemical series – significance – potentiometer titrations (redox -  $\text{Fe}^{2+}$  vs dichromate and precipitation –  $\text{Ag}^+$  vs  $\text{Cl}^-$  titrations) and conductometric titrations (acid-base – HCl vs, NaOH) titrations,

**UNIT II CORROSION AND CORROSION CONTROL 9**

Chemical corrosion – Pitting – Bedworth rule – electrochemical corrosion – different types – galvanic corrosion – differential aeration corrosion – factors influencing corrosion – corrosion control – sacrificial anode and impressed cathodic current methods – corrosion inhibitors – protective coatings – paints – constituents and functions – metallic coatings – electroplating (Au) and electroless (Ni) plating.

**UNIT III FUELS AND COMBUSTION 9**

Calorific value – classification – Coal – proximate and ultimate analysis metallurgical coke – manufacture by Otto-Hoffmann method – Petroleum processing and fractions – cracking – catalytic cracking and methods-knocking – octane number and cetane number – synthetic petrol – Fischer Tropsch and Bergius processes – Gaseous fuels-water gas, producer gas, CNG and LPG, Flue gas analysis – Orsat apparatus – theoretical air for combustion.

**UNIT IV PHASE RULE AND ALLOYS 9**

Statement and explanation of terms involved – one component system – water system – condensed phase rule – construction of phase diagram by thermal analysis – simple eutectic systems (lead-silver system only) – alloys – importance, ferrous alloys – nichrome and stainless steel – heat treatment of steel, non-ferrous alloys – brass and bronze.

**UNIT V ANALYTICAL TECHNIQUES 9**

Beer-Lambert's law (problem) – UV-visible spectroscopy and IR spectroscopy – principles – instrumentation (problem) (block diagram only) – estimation of iron by colorimetry – flame photometry – principle – instrumentation (block diagram only) – estimation of sodium by flame photometry – atomic absorption spectroscopy – principles – instrumentation (block diagram only) – estimation of nickel by atomic absorption spectroscopy.

**TOTAL: 45 PERIODS**

## TEXT BOOKS

1. P.C.Jain and Monica Jain, "Engineering Chemistry" Dhanpat Rai Pub, Co., New Delhi (2002).
2. S.S.Dara "A text book of Engineering Chemistry" S.Chand & Co.Ltd., New Delhi (2006).

## REFERENCES

1. B.Sivasankar "Engineering Chemistry" Tata McGraw-Hill Pub.Co.Ltd, New Delhi (2008).
2. B.K.Sharma "Engineering Chemistry" Krishna Prakasan Media (P) Ltd., Meerut (2001).

**ME2151**

**ENGINEERING MECHANICS**

**L T P C**  
**3 1 0 4**

## OBJECTIVE

At the end of this course the student should be able to understand the vectorial and scalar representation of forces and moments, static equilibrium of particles and rigid bodies both in two dimensions and also in three dimensions. Further, he should understand the principle of work and energy. He should be able to comprehend the effect of friction on equilibrium. He should be able to understand the laws of motion, the kinematics of motion and the interrelationship. He should also be able to write the dynamic equilibrium equation. All these should be achieved both conceptually and through solved examples.

## UNIT I BASICS & STATICS OF PARTICLES

**12**

Introduction – Units and Dimensions – Laws of Mechanics – Lame's theorem, Parallelogram and triangular Law of forces – Vectors – Vectorial representation of forces and moments – Vector operations: additions, subtraction, dot product, cross product – Coplanar Forces – Resolution and Composition of forces – Equilibrium of a particle – Forces in space – Equilibrium of a particle in space – Equivalent systems of forces – Principle of transmissibility – Single equivalent force.

## UNIT II EQUILIBRIUM OF RIGID BODIES

**12**

Free body diagram – Types of supports and their reactions – requirements of stable equilibrium – Moments and Couples – Moment of a force about a point and about an axis – Vectorial representation of moments and couples – Scalar components of a moment – Varignon's theorem – Equilibrium of Rigid bodies in two dimensions – Equilibrium of Rigid bodies in three dimensions – Examples

## UNIT III PROPERTIES OF SURFACES AND SOLIDS

**12**

Determination of Areas and Volumes – First moment of area and the Centroid of sections – Rectangle, circle, triangle from integration – T section, I section, - Angle section, Hollow section by using standard formula – second and product moments of plane area – Rectangle, triangle, circle from integration – T section, I section, Angle section, Hollow section by using standard formula – Parallel axis theorem and perpendicular axis theorem – Polar moment of inertia – Principal moments of inertia of plane areas – Principal axes of inertia – Mass moment of inertia – Derivation of mass moment of inertia for rectangular section, prism, sphere from first principle – Relation to area moments of inertia.

**UNIT IV DYNAMICS OF PARTICLES 12**  
Displacements, Velocity and acceleration, their relationship – Relative motion – Curvilinear motion – Newton’s law – Work Energy Equation of particles – Impulse and Momentum – Impact of elastic bodies.

**UNIT V FRICTION AND ELEMENTS OF RIGID BODY DYNAMICS 12**  
Frictional force – Laws of Coloumb friction – simple contact friction – Rolling resistance – Belt friction.  
Translation and Rotation of Rigid Bodies – Velocity and acceleration – General Plane motion.

**TOTAL: 60 PERIODS**

**TEXT BOOK**

1. Beer, F.P and Johnson Jr. E.R. “Vector Mechanics for Engineers”, Vol. 1 Statics and Vol. 2 Dynamics, McGraw-Hill International Edition, (1997).

**REFERENCES**

1. Rajasekaran, S, Sankarasubramanian, G., “Fundamentals of Engineering Mechanics”, Vikas Publishing House Pvt. Ltd., (2000).
2. Hibbeller, R.C., “Engineering Mechanics”, Vol. 1 Statics, Vol. 2 Dynamics, Pearson Education Asia Pvt. Ltd., (2000).
3. Palanichamy, M.S., Nagam, S., “Engineering Mechanics – Statics & Dynamics”, Tata McGraw-Hill, (2001).
4. Irving H. Shames, “Engineering Mechanics – Statics and Dynamics”, IV Edition – Pearson Education Asia Pvt. Ltd., (2003).
5. Ashok Gupta, “Interactive Engineering Mechanics – Statics – A Virtual Tutor (CDROM)”, Pearson Education Asia Pvt., Ltd., (2002).

**EE2151 CIRCUIT THEORY L T P C**  
(Common to EEE, EIE and ICE Branches) **3 1 0 4**

**UNIT I BASIC CIRCUITS ANALYSIS 12**  
Ohm’s Law – Kirchoffs laws – DC and AC Circuits – Resistors in series and parallel circuits – Mesh current and node voltage method of analysis for D.C and A.C. circuits.

**UNIT II NETWORK REDUCTION AND NETWORK THEOREMS FOR DC AND AC CIRCUITS 12**  
Network reduction: voltage and current division, source transformation – star delta conversion.  
Thevenins and Novton & Theorem – Superposition Theorem – Maximum power transfer theorem – Reciprocity Theorem.

**UNIT III RESONANCE AND COUPLED CIRCUITS 12**  
Series and paralled resonance – their frequency response – Quality factor and Bandwidth - Self and mutual inductance – Coefficient of coupling – Tuned circuits – Single tuned circuits.

**UNIT IV TRANSIENT RESPONSE FOR DC CIRCUITS 12**  
Transient response of RL, RC and RLC Circuits using Laplace transform for DC input and A.C. with sinusoidal input.

**UNIT V ANALYSING THREE PHASE CIRCUITS 12**

Three phase balanced / unbalanced voltage sources – analysis of three phase 3-wire and 4-wire circuits with star and delta connected loads, balanced & unbalanced – phasor diagram of voltages and currents – power and power factor measurements in three phase circuits.

**TOTAL : 60 PERIODS**

**TEXT BOOKS**

1. William H. Hayt Jr, Jack E. Kemmerly and Steven M. Durbin, “Engineering Circuits Analysis”, Tata McGraw Hill publishers, 6<sup>th</sup> edition, New Delhi, (2002).
2. Sudhakar A and Shyam Mohan SP, “Circuits and Network Analysis and Synthesis”, Tata McGraw Hill, (2007).

**REFERENCES**

1. Paranjothi SR, “Electric Circuits Analysis,” New Age International Ltd., New Delhi, (1996).
2. Joseph A. Edminister, Mahmood Nahri, “Electric circuits”, Schaum’s series, Tata McGraw-Hill, New Delhi (2001).
3. Chakrabati A, “Circuits Theory (Analysis and synthesis), Dhanpath Rai & Sons, New Delhi, (1999).
4. Charles K. Alexander, Mathew N.O. Sadik, “Fundamentals of Electric Circuits”, Second Edition, McGraw Hill, (2003).

**EC2151 ELECTRIC CIRCUITS AND ELECTRON DEVICES L T P C**  
(For ECE, CSE, IT and Biomedical Engg. Branches) **3 1 0 4**

**UNIT I CIRCUIT ANALYSIS TECHNIQUES 12**

Kirchoff’s current and voltage laws – series and parallel connection of independent sources – R, L and C – Network Theorems – Thevenin, Superposition, Norton, Maximum power transfer and duality – Star-delta conversion.

**UNIT II TRANSIENT RESONANCE IN RLC CIRCUITS 12**

Basic RL, RC and RLC circuits and their responses to pulse and sinusoidal inputs – frequency response – Parallel and series resonances – Q factor – single tuned and double tuned circuits.

**UNIT III SEMICONDUCTOR DIODES 12**

Review of intrinsic & extrinsic semiconductors – Theory of PN junction diode – Energy band structure – current equation – space charge and diffusion capacitances – effect of temperature and breakdown mechanism – Zener diode and its characteristics.

**UNIT IV TRANSISTORS 12**

Principle of operation of PNP and NPN transistors – study of CE, CB and CC configurations and comparison of their characteristics – Breakdown in transistors – operation and comparison of N-Channel and P-Channel JFET – drain current equation – MOSFET – Enhancement and depletion types – structure and operation – comparison of BJT with MOSFET – thermal effect on MOSFET.

**UNIT V SPECIAL SEMICONDUCTOR DEVICES (Qualitative Treatment only) 12**  
Tunnel diodes – PIN diode, varactor diode – SCR characteristics and two transistor equivalent model – UJT – Diac and Triac – Laser, CCD, Photodiode, Phototransistor, Photoconductive and Photovoltaic cells – LED, LCD.

**TOTAL : 60 PERIODS**

**TEXT BOOKS**

1. Joseph A. Edminister, Mahmood, Nahri, "Electric Circuits" – Shaum series, Tata McGraw Hill, (2001)
2. S. Salivahanan, N. Suresh kumar and A. Vallavanraj, "Electronic Devices and Circuits", Tata McGraw Hill, 2<sup>nd</sup> Edition, (2008).
3. David A. Bell, "Electronic Devices and Circuits", Oxford University Press, 5<sup>th</sup> Edition, (2008).

**REFERENCES**

1. Robert T. Paynter, "Introducing Electronics Devices and Circuits", Pearson Education, 7<sup>th</sup> Edition, (2006).
2. William H. Hayt, J.V. Jack, E. Kemmebly and Steven M. Durbin, "Engineering Circuit Analysis", Tata McGraw Hill, 6<sup>th</sup> Edition, 2002.
3. J. Millman & Halkins, Satyabranta Jit, "Electronic Devices & Circuits", Tata McGraw Hill, 2<sup>nd</sup> Edition, 2008.

**GE2151 BASIC ELECTRICAL AND ELECTRONICS ENGINEERING L T P C**  
(Common to branches under Civil, Mechanical and Technology faculty) **4 0 0 4**

**UNIT I ELECTRICAL CIRCUITS & MEASUREMENTS 12**

Ohm's Law – Kirchoff's Laws – Steady State Solution of DC Circuits – Introduction to AC Circuits – Waveforms and RMS Value – Power and Power factor – Single Phase and Three Phase Balanced Circuits.

Operating Principles of Moving Coil and Moving Iron Instruments (Ammeters and Voltmeters), Dynamometer type Watt meters and Energy meters.

**UNIT II ELECTRICAL MECHANICS 12**

Construction, Principle of Operation, Basic Equations and Applications of DC Generators, DC Motors, Single Phase Transformer, single phase induction Motor.

**UNIT III SEMICONDUCTOR DEVICES AND APPLICATIONS 12**

Characteristics of PN Junction Diode – Zener Effect – Zener Diode and its Characteristics – Half wave and Full wave Rectifiers – Voltage Regulation.

Bipolar Junction Transistor – CB, CE, CC Configurations and Characteristics – Elementary Treatment of Small Signal Amplifier.

**UNIT IV DIGITAL ELECTRONICS 12**

Binary Number System – Logic Gates – Boolean Algebra – Half and Full Adders – Flip-Flops – Registers and Counters – A/D and D/A Conversion (single concepts)

**UNIT V FUNDAMENTALS OF COMMUNICATION ENGINEERING 12**  
Types of Signals: Analog and Digital Signals – Modulation and Demodulation: Principles of Amplitude and Frequency Modulations.

Communication Systems: Radio, TV, Fax, Microwave, Satellite and Optical Fibre (Block Diagram Approach only).

**TOTAL : 60 PERIODS**

**TEXT BOOKS**

1. V.N. Mittle “Basic Electrical Engineering”, Tata McGraw Hill Edition, New Delhi, 1990.
2. R.S. Sedha, “Applied Electronics” S. Chand & Co., 2006.

**REFERENCES**

1. Muthusubramanian R, Salivahanan S and Muraleedharan K A, “Basic Electrical, Electronics and Computer Engineering”, Tata McGraw Hill, Second Edition, (2006).
2. Nagsarkar T K and Sukhija M S, “Basics of Electrical Engineering”, Oxford press (2005).
3. Mehta V K, “Principles of Electronics”, S.Chand & Company Ltd, (1994).
4. Mahmood Nahvi and Joseph A. Edminister, “Electric Circuits”, Schaum’ Outline Series, McGraw Hill, (2002).
5. Premkumar N, “Basic Electrical Engineering”, Anuradha Publishers, (2003).

**GE2152 BASIC CIVIL & MECHANICAL ENGINEERING L T P C**  
(Common to branches under Electrical and I & C Faculty) **4 0 0 4**

**A – CIVIL ENGINEERING**

**UNIT I SURVEYING AND CIVIL ENGINEERING MATERIALS 15**  
**Surveying:** Objects – types – classification – principles – measurements of distances – angles – leveling – determination of areas – illustrative examples.

**Civil Engineering Materials:** Bricks – stones – sand – cement – concrete – steel sections.

**UNIT II BUILDING COMPONENTS AND STRUCTURES 15**  
**Foundations:** Types, Bearing capacity – Requirement of good foundations.

**Superstructure:** Brick masonry – stone masonry – beams – columns – lintels – roofing – flooring – plastering – Mechanics – Internal and external forces – stress – strain – elasticity – Types of Bridges and Dams – Basics of Interior Design and Landscaping.

**TOTAL: 30 PERIODS**

**B – MECHANICAL ENGINEERING**

**UNIT III POWER PLANT ENGINEERING 10**  
Introduction, Classification of Power Plants – Working principle of steam, Gas, Diesel, Hydro-electric and Nuclear Power plants – Merits and Demerits – Pumps and turbines – working principle of Reciprocating pumps (single acting and double acting) – Centrifugal Pump.

**UNIT IV I C ENGINES 10**  
 Internal combustion engines as automobile power plant – Working principle of Petrol and Diesel Engines – Four stroke and two stroke cycles – Comparison of four stroke and two stroke engines – Boiler as a power plant.

**UNIT V REFRIGERATION AND AIR CONDITIONING SYSTEM 10**  
 Terminology of Refrigeration and Air Conditioning. Principle of vapour compression and absorption system – Layout of typical domestic refrigerator – Window and Split type room Air conditioner.

**TOTAL: 30 PERIODS**

**REFERENCES**

1. Shanmugam G and Palanichamy M S, “Basic Civil and Mechanical Engineering”, Tata McGraw Hill Publishing Co., New Delhi, (1996).
2. Ramamrutham. S, “Basic Civil Engineering”, Dhanpat Rai Publishing Co. (P) Ltd. (1999).
3. Seetharaman S. “Basic Civil Engineering”, Anuradha Agencies, (2005).
4. Venugopal K and Prahu Raja V, “Basic Mechanical Engineering”, Anuradha Publishers, Kumbakonam, (2000).
5. Shantha Kumar S R J., “Basic Mechanical Engineering”, Hi-tech Publications, Mayiladuthurai, (2000).

**GE2155 COMPUTER PRACTICE LABORATORY – II L T P C**  
**0 1 2 2**

**LIST OF EXPERIMENTS**

**1. UNIX COMMANDS 15**

Study of Unix OS - Basic Shell Commands - Unix Editor

**2. SHELL PROGRAMMING 15**

Simple Shell program - Conditional Statements - Testing and Loops

**3. C PROGRAMMING ON UNIX 15**

Dynamic Storage Allocation-Pointers-Functions-File Handling

**TOTAL : 45 PERIODS**

**HARDWARE / SOFTWARE REQUIREMENTS FOR A BATCH OF 30 STUDENTS**

**Hardware**

- . 1 UNIX Clone Server
- . 33 Nodes (thin client or PCs)
- . Printer – 3 Nos.

**Software**

- . OS – UNIX Clone (33 user license or License free Linux)
- . Compiler - C

**LIST OF EXPERIMENTS**

1. Determination of Young's modulus of the material – non uniform bending.
2. Determination of Band Gap of a semiconductor material.
3. Determination of specific resistance of a given coil of wire – Carey Foster Bridge.
4. Determination of viscosity of liquid – Poiseuille's method.
5. Spectrometer dispersive power of a prism.
6. Determination of Young's modulus of the material – uniform bending.
7. Torsional pendulum – Determination of rigidity modulus.

- A minimum of FIVE experiments shall be offered.
- Laboratory classes on alternate weeks for Physics and Chemistry.
- The lab examinations will be held only in the second semester.

**LIST OF EXPERIMENTS**

1. Conduct metric titration (Simple acid base)
2. Conduct metric titration (Mixture of weak and strong acids)
3. Conduct metric titration using  $\text{BaCl}_2$  vs  $\text{Na}_2\text{SO}_4$
4. Potentiometric Titration ( $\text{Fe}^{2+}$  /  $\text{KMnO}_4$  or  $\text{K}_2\text{Cr}_2\text{O}_7$ )
5. PH titration (acid & base)
6. Determination of water of crystallization of a crystalline salt (Copper sulphate)
7. Estimation of Ferric iron by spectrophotometry.

- A minimum of FIVE experiments shall be offered.
- Laboratory classes on alternate weeks for Physics and Chemistry.
- The lab examinations will be held only in the second semester.

**List of Exercises using software capable of Drafting and Modeling**

1. Study of capabilities of software for Drafting and Modeling – Coordinate systems (absolute, relative, polar, etc.) – Creation of simple figures like polygon and general multi-line figures.
2. Drawing of a Title Block with necessary text and projection symbol.
3. Drawing of curves like parabola, spiral, involute using Bspline or cubic spline.
4. Drawing of front view and top view of simple solids like prism, pyramid, cylinder, cone, etc, and dimensioning.
5. Drawing front view, top view and side view of objects from the given pictorial views (eg. V-block, Base of a mixie, Simple stool, Objects with hole and curves).

6. Drawing of a plan of residential building ( Two bed rooms, kitchen, hall, etc.)
7. Drawing of a simple steel truss.
8. Drawing sectional views of prism, pyramid, cylinder, cone, etc,
9. Drawing isometric projection of simple objects.
10. Creation of 3-D models of simple objects and obtaining 2-D multi-view drawings from 3-D model.

**TOTAL: 45 PERIODS**

**Note: Plotting of drawings must be made for each exercise and attached to the records written by students.**

**List of Equipments for a batch of 30 students:**

1. Pentium IV computer or better hardware, with suitable graphics facility -30 No.
2. Licensed software for Drafting and Modeling. – 30 Licenses
3. Laser Printer or Plotter to print / plot drawings – 2 No.

**EE2155**

**ELECTRICAL CIRCUIT LABORATORY**  
(Common to EEE, EIE and ICE)

**L T P C**  
**0 0 3 2**

**LIST OF EXPERIMENTS**

1. Verification of ohm's laws and kirchoff's laws.
2. Verification of Thevemin's and Norton's Theorem
3. Verification of superposition Theorem
4. Verification of maximum power transfer theorem.
5. Verification of reciprocity theorem
6. Measurement of self inductance of a coil
7. Verification of mesh and nodal analysis.
8. Transient response of RL and RC circuits for DC input.
9. Frequency response of series and parallel resonance circuits.
10. Frequency response of single tuned coupled circuits.

**TOTAL: 45 PERIODS**

**EC2155**

**CIRCUITS AND DEVICES LABORATORY**

**L T P C**  
**0 0 3 2**

1. Verification of KVL and KCL
2. Verification of Thevenin and Norton Theorems.
3. Verification of superposition Theorem.
4. Verification of Maximum power transfer and reciprocity theorems.
5. Frequency response of series and parallel resonance circuits.
6. Characteristics of PN and Zener diode
7. Characteristics of CE configuration
8. Characteristics of CB configuration
9. Characteristics of UJT and SCR
10. Characteristics of JFET and MOSFET
11. Characteristics of Diac and Triac.
12. Characteristics of Photodiode and Phototransistor.

**TOTAL: 45 PERIODS**

## ENGLISH LANGUAGE LABORATORY (Optional)

L T P C  
0 0 2 -

### 1. Listening:

5

Listening & answering questions – gap filling – Listening and Note taking- Listening to telephone conversations

### 2. Speaking:

5

Pronouncing words & sentences correctly – word stress – Conversation practice.

### Classroom Session

20

1. Speaking: Introducing oneself, Introducing others, Role play, Debate- Presentations: Body language, gestures, postures. Group Discussions etc
2. Goal setting – interviews – stress time management – situational reasons

### Evaluation

(1) Lab Session – 40 marks

Listening – 10 marks  
Speaking – 10 marks  
Reading – 10 marks  
Writing – 10 marks

(2) Classroom Session – 60 marks

Role play activities giving real life context – 30 marks  
Presentation – 30 marks

### Note on Evaluation

1. Examples for role play situations:
  - a. Marketing engineer convincing a customer to buy his product.
  - b. Telephone conversation – Fixing an official appointment / Enquiry on availability of flight or train tickets / placing an order. etc.
2. Presentations could be just a Minute (JAM activity) or an Extempore on simple topics or visuals could be provided and students could be asked to talk about it.

### REFERENCES

1. Hartley, Peter, Group Communication, London: Routledge, (2004).
2. Doff, Adrian and Christopher Jones, Language in Use – (Intermediate level), Cambridge University Press, (1994).
3. Gammidge, Mick, Speaking Extra – A resource book of multi-level skills activities , Cambridge University Press, (2004).
4. Craven, Miles, Listening Extra - A resource book of multi-level skills activities, Cambridge, Cambridge University Press, (2004).
5. Naterop, Jean & Rod Revell, Telephoning in English, Cambridge University Press, (1987).

### LAB REQUIREMENTS

1. Teacher – Console and systems for students
2. English Language Lab Software
3. Tape Recorders.



**AIM**

- The aim of this course is 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 – solid 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 protection 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', 2<sup>nd</sup> edition, Pearson Education (2004).
2. Benny Joseph, 'Environmental Science and Engineering', Tata McGraw-Hill, New Delhi, (2006).

**REFERENCES BOOKS:**

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)

**UNIT I INTRODUCTION TO ORGANIC CHEMISTRY 12**

Organic reaction and mechanisms – Inductive effect, Mesomeric effect – Hyperconjugation effect – Resonance and resonance energy – Electromeric effect – Aromaticity – Substitution reactions.

**UNIT II CARBOHYDRATES 12**

Introduction – Mono and Disaccharides – Important reactions – Polysaccharides – Starch and Cellulose – Derivates of Cellulose – Carboxy Methyl cellulose and gun cotton – structural aspects of cellulose, Lignin-structure and properties, delignification of lingocelluloses-chemistry and mechanism.

**UNIT III ORGANO METALLIC COMPOUNDS HETEROCYCLIC COMPOUNDS 12**

Grignard reagents and their synthetic utility – Organo Silicon compounds. hetro cyclic compounds - Furan, Thiophone, Pyrrole, Pyridine and indole – Their important derivatives.

**UNIT IV OILS, FATS AND WAXES AMINO ACID AND PROTEINS 12**

Analysis of oils and fats – classification of waxes, Classification of proteins – Tests for proteins – Denaturation – structural aspects of wool and silk. chemistry of oil, fat and wax present in cotton, sericin in silk, grease in wool.

**UNIT V DYES AND DYEING 12**

Synthesis of Methyl orange, Methyl red and Congo red, Malachite green, Para Rosaniline Alizarin, Phthalein dyes – Eosin preparation. Introduction to Natural and Reactive dyes. Classification of dyes and intermediates such as azines, oxazines, thiazine, acridine, thioazole, eqinoline, cyanide dyes, di phenyl and tri phenyl methane dyes

**TOTAL : 60 PERIODS**

**REFERENCES**

1. Bahl.B.S and Arun Bahl, Advanced Organic Chemistry ,3<sup>rd</sup> Edition, Sultan Chand and sons , New Delhi.,1994
2. Morrison.R.T and Boyd.R.N Organic Chemistry – VI Edition, Prentice Hall Inc. USA. 1996
3. Agarwal.O.P Synthetic Organic Chemistry – Vth Edition Goel Publishing house, Meerut. 1991
4. Ashutoshkar, Medicinal Organic Chemistry, New Age International Private Ltd., Chennai. 1993
5. Tiwari, K.S. Vishnoi. N.K, and Vishnoi S.N., 'A Text book of Organic Chemistry' Second Edition, Vikas Publishing House, New Delhi, 1998

- UNIT I POLYMERIZATION 12**  
Definition. Criteria for fiber forming. Polymers, Classification. Polymerization Mechanisms: Chain (Ionic, Radical and Condensation). Polymerization Techniques- Bulk, Solution, Suspension, Emulsion, Solid and Gas Phase, Polycondensation Techniques –Melt, Solution and Interfacial.
- UNIT II POLYMER PRODUCTION 12**  
Properties and applications: Polyester (PET, PBT, PTT) and Polyamides (Nylon 6, Nylon 6, 6) Polypropylene, Poly (acrylonitrile) (Acrylic and Modacrylic), Polyurethane, Polyethylene (LDPE, HDPE), Poly(vinylchloride) PVC, Poly (tetrafluoroethylene) PTFE.
- UNIT III REGENERATED CELLULOSE AND PROTEIN 12**  
Manufacture of Viscose, Cuprammonium and Acetate rayon, Modified high wet modulus – Polynosic, Lyocell – Super high wet modulus. Regenerated protein:
- UNIT IV CHARACTERIZATION OF POLYMERS 12**  
Degree of Polymerization, different average molecular Weights (Number, Weight and Z-average), Determination of weight average by Light Scattering, Number Average by End Group Analysis, Gel Permeation Chromatography and Osmometry and Viscosity Average by Ubbelohde viscometer. Thermal characterization of polymers: Principles, methods, Interpretation of DSC, TGA and DTGA results.
- UNIT V POLYMER PROCESSING AND REUSE OF POLYMERS 12**  
Additives of Polymers-fillers, Plasticizers, Antioxidants, UV stabilizers, Colouring agents. Polymer Processing Methods-Moulding, Extrusion, Calendaring, Film Casting. Recovery from polyester, nylon polymers. Nylon-Recovery from liquid waste, solid waste. Reuse of acrylic and polypropylene wastes.

**LECTURE : 45 TUTORIAL : 15 TOTAL : 60 PERIODS**

**REFERENCES**

1. Gowrikar. V. R., Viswanathan, N. V., and Jayadev Sreedhar, "Polymer Science" New age publication Ltd, New Delhi 2003
2. Gupta V. B. and Kothari V. K., "Manufacture fibre technology", Chapman & Hall publication 1997, UK
3. Billmeyer F. W., Textbook of Polymer Science, Wiley Inter Science, New York, 2002
4. Odion G., Principles of Polymerization, John Wiley, UK, 2002.
5. Woodings C., Regenerated Cellulose Fibres, Woodhead Publishing, UK, 2000

**UNIT I RAW MATERIALS 12**

Raw materials and coal tar distillation. Aromatic hydrocarbons from petroleum. Tests and standards of purity. Chemistry of surfactants - wetting agents – defoamers - sequestering agents - dispersing agents - reducing agents - oxidizing agents and organic stabilizer

**UNIT II DYE INTERMEDIATES 12**

Classification of dyes and intermediates, colour and chemical constitution viz, azines, oxazines, thiazines, xanthine, acridine, thazole, equinoline, cyanide dyes. Diphenyl and triphenyl methane dyes.

**UNIT III SYNTHESISATION 12**

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

**UNIT IV AROMATIC INTERMEDIATES 12**

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

**UNIT V DYES 12**

Anthraquinone vat dyes, indigoid and thioindigoid dyes, solubilised vat dyes, sulphur colour, phthalocyanines, reactive dyes, disperse dyes. Fluorescent brightening and blueing agents – their chemistry and preparation.

**LECTURE : 45 TUTORIAL : 15 TOTAL : 60 PERIODS**

**REFERENCES**

1. Shenai,V.A., "Introduction to the Chemistry of Dyestuffs", Sevak Publications, Mumbai 1995.
2. Venkatraman.K., "The Chemistry of Synthetic Dyes" – Vol. I & II, Academic press, London, 1990
3. Shore,J. (Ed)., "Colorants and auxiliaries, Volume 1,:Colorants", SDC, Blackwells, Leeds, 1990,
4. Shore,J. (Ed)., "Colorants and auxiliaries, Volume 2: Auxiliaries", SDC, Blackwells, Leeds, 1990,
5. David.R.Waring, Geoffrey Hallas, The Chemisry and Application of Dyes, SDC,1990
6. Shenai.V.A and Saraf.N.M "Synthetic Organic Textile Chemicals Vol. III", Sevak Publications, Mumbai.1995.

**UNIT I GINNING, OPENING AND CLEANING 12**

Various types of ginning, ginning performance. Objects of opening and cleaning. Blending Blow room machines, Blow room line for cotton, man-made fibres and blends. Objectives and working of semi-high production and high production card.

**UNIT II FIBRE DRAFTING 12**

Objectives and working of draw frame, various drafting systems, speed frame, bobbin and flyer lead roving process, and comber, sequence and timing of operations in combing, types of feeding, methods of lap preparation, stop motions, settings and speeds

**UNIT III YARN SPINNING 12**

Yarn production by ring spinning, drafting system, cop building motions; condensed yarn spinning; rotor spinning, economic benefits, mechanism of yarn formation, friction spinning, yarn formation process, merits and demerits, open end and core-sheath type friction spun yarns and air jet spinning. principles and methods; ply yarn production, wrap spinning, double rove spinning, core yarn spinning, twistless and self twist spinning

**UNIT IV WEAVING PREPARATION 12**

Winding, parallel, cross and precision winding, clearers, knotters and splicers, cheese and cone winding; warping, beam and sectional warping, sizing, machines, size preparation, drying, single end sizing and Drawing in, working principle, manual, semiautomatic and automatic machines

**UNIT V WEAVING AND KNITTING 12**

Woven fabric structure – Simple weaves – Weaving machines- plain, automatic and shuttle looms, stop motions, terry weaving. Principles of Knitting, simple structures, circular, warp and flat knitting, jacquard knitting, formation of stitches

**LECTURE: 45 TUTORIAL: 15 TOTAL: 60 PERIODS**

**REFERENCES**

1. Lord.P.R “Yarn production Science Technology and Economics”, Textile Institute, Manchester, U.K,1999.
2. Lord P.R and Mohamed M.H, Weaving- Conversion of Yarn to Fabric, Merrow, 1998,
3. Wynne,A. ‘Textiles’, Macmillan, London, 1997,.
4. Ajgnorkar.D.B, “Knitting Technology”, Universal publication Corporation, Mumbai,1998
5. Klein.W, Short staple Spinning Systems, Vol.1-3, Textile Institute.U.K,1998
6. Corbmen,B.P, Textiles - Fibre to fabric ,McGraw Hill International, Singapore, 6<sup>th</sup> Edition,1999

**TC3208**

**TEXTILE CHEMICALS ANALYSIS LABORATORY**

**L T P C  
0 0 3 2**

**List of Experiments**

1. Estimation of the Efficiency of the wetting agent.
2. Evaluation of the oxidizing agent.
3. Evaluation of the reducing agent.
4. Evaluation of the dispersing agent.
5. Evaluation of the Optical Brightening agent.
6. Analysis of oils and soaps.
7. Evaluation of the inorganic substances in Textile processing.
8. Identification of dye powder.
9. Identification of the dye in the dyed fabric
10. Estimation of percentage purity of the dye solution.
11. Evaluation of the finishing chemicals

**TOTAL : 45 PERIODS**

**TC3209**

**YARN AND FABRIC MANUFACTURING LABORATORY**

**L T P C  
0 0 3 2**

**List of Experiments**

**Yarn Manufacture**

1. Sketching the various parts of blow room and card indicating the passage of material giving the settings and speeds for the processing of long/medium/short stapled fibres.
2. Drawing the passage of material through a draw frame with 4/4 drafting system and 4/5 drafting system and giving the setting for cotton of different staple length.
3. Give the passage of material through the comber with settings for increasing comber water.
4. Sketching the building mechanism indicating change places for altering the coils per inch in the bobbin.
5. Estimating the draft, intermediate draft and draft constant front roller delivery and production of the ring frame.

**Fabric Manufacture**

6. Assembling and setting to time the dismantled parts of the shedding mechanism including the top-reversing device.
7. Assembling and setting to time the dismantled parts of cone over pick mechanism.
8. Setting the crank and sley and calculating the sley eccentricity.
9. Assembling and setting to time the dismantled parts of 7 wheel take-up motion.
10. Dismantling and assembling the parts of Negative let-off mechanism with back rest settings.
11. Sketching the various parts of simple knitting machines.

**TOTAL : 45 PERIODS**

**S.No List of Experiments**

1. Identification of longitudinal & cross sectional view of cellulosic fibers
2. Identification of longitudinal & cross sectional view of Protein fibers
3. Identification of longitudinal & cross sectional view of Synthetic fibers
4. Identification of burning behavior of Cellulosic fibres
5. Identification of burning behavior of Protein fibers
6. Identification of burning behavior of Synthetic fibers
7. Determination of Moisture Regain of Cellulosic fibres
8. Determination of Moisture Regain of Protein fibres
9. Determination of Moisture Regain of Synthetic fibres
10. Determination of Density of Fibres
11. Identification of Cellulosic fibre by Staining Test
12. Identification of Protein fibre by Staining Test
13. Identification of Synthetic fibre by Staining Test
14. Identification of Cellulosic fibres by solvent method
15. Identification of Protein fibres by solvent method
16. Identification of Synthetic fibres by solvent method

**TOTAL : 45 PERIODS****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 –  $\chi^2$ -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 - 22 - factorial design.

**UNIT V STATISTICAL QUALITY CONTROL 9 + 3**  
Control charts for measurements (X and R charts) – Control charts for attributes (p, c and np charts) – Tolerance limits - Acceptance sampling.

**T : 45 + 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).

**TC3220**

**PHYSICAL CHEMISTRY**

**L T P C  
3 0 0 3**

**UNIT I ELECTROCHEMISTRY 9**  
Electrical Conductance – Specific conductance – Equivalent conductance – various 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.

**UNIT II CHEMICAL KINETICS 9**  
Kinetics of parallel and opposing reactions – concept of activation energy – Arrhenius equation – Theory of absolute reaction rates – Kinetics of Enzyme Catalyzed reactions. Kinetics, characteristics of second order reaction, Kinetics, characteristics of consecutive reaction. Effect of temp on reaction rate, theory of absolute reaction rate, steady state principle.

**UNIT III PHASE RULE 9**  
Definition – Derivation – Application of phase rule to water system – Thermal Analysis – Cooling curves – Two Component system – Eutectic and compound formation.

**UNIT IV ADSORPTION AND CATALYSIS 9**  
Physical and chemical adsorption – Types of adsorption isotherms, BET method, Gibbs equation, Homogeneous catalysis – Heterogeneous catalysis, acid – base catalysis, Enzyme catalysis – Applications of catalysis in industries.

**UNIT V COLLOIDS 9**  
Introduction to colloids – properties of colloids – Electro kinetic phenomena – Donnan Membrane equilibrium – Emulsions – Gels – colloidal electrolytes.  
Laws of Photochemistry, Quantum efficiency, and photochemical reactions.  
Actinometrical, Kinetics and mechanism of Hydrogen – Bromine reaction.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Bahl, B.S., Tuli, G.D & Arun Bahl, Essentials of Physical Chemistry, Twenty third Edition, S.Chand & Company Ltd., New Delhi, 1994
2. Puri B.H. and Sharma L.R. Principles of Physical Chemistry, S. Nagin Chand and Company, Delhi, 1994
3. Kund and Jain Physical Chemistry, S. Chand and Company, Delhi, 1996
4. Gordon M. Barrow, Physical Chemistry, Sixth edition, Tata McGraw-Hill, 1998

**TC3213 INSTRUMENTATION AND MICRO PROCESSORS L T P C  
3 0 0 3**

**UNIT I INTRODUCTION 9**  
Electronic principles – PN devices – semi conductor diodes. Transistors – basics – integrated circuits. Operational amplifier ICS – characteristics and pin details analog circuits. Amplifiers using operational amplifier IC – inverting, noninverting, differential. Summers, integrators, differentiators. Other signal conditioning circuits – basics of passive and active filters.

**UNIT II MICROPROCESSOR 9**  
Addition, subtraction devices – function generation – linearization. Digital circuits – Clock – Gates – Truth table – Decoders, Encoders, ROM and RAM. Flip-flops – Counters – ripple, divide by N and up down counters. Microprocessor based systems – An elementary introduction of the chips and organization. Analog to digital conversion – DIGITAL APPLICATIONS of signal conditioning.

**UNIT III INTRODUCTION TO MEASUREMENT 9**  
General measurement system – an introduction – static and dynamic measurement – System response – rise time – distortion – impedance matching. Basic input circuits – Ballast, Voltage divider and bridge circuits. Sensitivity and loading error of these circuits. Motion measurement – translational, rotary and relative displacement transducers, Resistive transducers. Capacitive, inductive pick ups – LVDT.

**UNIT IV STRAIN GAUGES AND MEASUREMENT 9**

Strain gauges – basics and types – Piezo resistance Gauge factor. Mounting of strain gauges and strain bridges – calibration and balancing. Force measurement – Torque and load cells – instrumentation. Temperature measurement - standards and calibration – Thermal expansion methods. Thermo electric sensors – basics – types – materials – circuits – Bridge compensation – Cold junction circuits. Electric resistance and semiconductor temperature sensors. Flow measurement – velocity, magnitude and direction measurement. Anemometers – discharge measuring sensors – Mass flow meters, pH, Viscosity, liquid level, humidity measurement.

**UNIT V TEXTILE SPECIFIC INSTRUMENTATION 9**

Speed measurement and event counting using photo electric and reluctance principles – Proximity sensors. Instrumentation specific to Textile processing industry. Indicating and recording devices – Basic analog and digital meters – Standards and calibration. Cathode ray oscilloscopes and xy plotters and digital printers and plotters – magnetic disc and tape storage – Data loggers.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Malvino, “ Electronics Principles”,Tata McGraw HillNew Delhi,1999
2. Nagrath.I.J and Gopal, M, “ Control System Engineering”,Willey Eastern Ltd.1995
3. Ramesh S.Goankar, “Microprocessor Architecture, Programming and Applications with the 8085”,Penram International Publishing, 2000
4. Sawhney,A.K,A, “Course in Electrical and Electronic Measurement and Instrumentation”,Dhanpet Rai & Sons,New Delhi,2001
5. Hiran Joshi and Gauri Joshi, “Electronic controls for Textile Machines”, NCUTE Publication,New Delhi,2003

**TC3214 PREPARATION OF TEXTILES FOR COLORATION L T P C  
3 0 0 3**

**UNIT I SINGEING & DESIZING 9**

Impurities present in different fibres, Inspection of grey goods and lot preparation. Shearing and Cropping Singeing of cotton and blended fabrics. Yarn singeing - Singeing of tubular knitted fabrics. Tightrope, Slack rope washing. Acid desizing and its limitations, enzyme desizing – Open width washing machine. Degumming of silks using soap, soap and soda ash, acids, amines and enzymes.

**UNIT II MERCERISATION 9**

Mergerizing - conditions. Physical and Chemical changes – Mercerizing of coloured goods P/C blends and tubular knits.Typical recipe for desizing of different materials – different desizing methods. Effects of Time, Tension, Caustic Concentration, Temp on mercerizing effects. Stack mercerizing, Hot mercerizing, mercerizing of blending fabrics.

**UNIT III SCOURING 9**

Principles of Scouring: jumbo/JT-10, Vapourlac and soft flow machine, Chemical and auxiliaries for Scouring - Scouring of coloured goods – Degumming of Silk, Scouring of wool, silk P/C, P/V blends – Scouring of Jute, Sourcing of synthetic textiles, Solvent Scouring, Bio Scouring. Auxiliaries required for scouring of different materials and with respect to different materials.

**UNIT IV BLEACHING 9**

Principles of Bleaching: Importance of whiteness and whiteness retention – Bleaching mechanism of Hydrogen Peroxide, Hypo chlorites and Sodium chlorite – Parameters involved in bleaching action – Merits and Demerits of each bleaching agent – bleaching in rope form bleaching in Kier, Jumbo Jigger – Continuous scouring and Bleaching of cotton goods in open width and rope form using H<sub>2</sub>O<sub>2</sub> – Yarn Scouring and Bleaching using Cabinet hank dyeing machine. Bleaching of p/c blend in open width form by Pad roll and continuous methods using Hydrogen Peroxide and Sodium chlorite, bleaching of Jute – Knitted fabric bleaching on winches, soft flow – The concept of full bleaching –Mechanism of Whitening effect. Blueing agents and its use. Combined Bleaching & whitening. Typical recipe for bleaching of different fibres.

**UNIT V DEVELOPMENTS 9**

Developments in grey preparation – combined processing enzymatic scouring & bleaching, cold bleaching; prograde process (liquid ammonia mercerization) Developments in desizing, Scouring, Bleaching and mercerizing, plasma based preparation, ozone bleaching.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Trotman, E.R., Textile Scouring and Bleaching, Charless Griffins, Com. Ltd., London 1990.
2. Shenai V.A., Technology of Bleaching and Mercerizing, Sevak Publications, Wadala, Chennai, 1991.
3. Charles Tomasno, Chemistry and Technology of fabric Preparation and Finishing, North Carolina State University, USA, 1992
4. Nalankilli.G, Edwin Sundar.A, Chemical Preparatory Processes for Textiles, NCUTE Publications, New Delhi, 2002
5. Karmakar, S.R., Chemical Technology in the Pre-Treatment Processes of Textiles. Elsevier Science, 1999
6. Chakraborty, J.N, Fundamentals and Practices in colouration of textiles, Woodhead Publishing India, 2009, ISBN – 13: 978-81-908001-4-3

**TC3215 PHYSICAL TESTING OF TEXTILE MATERIALS L T P C  
3 0 0 3**

**UNIT I INTRODUCTION 9**

Definition of quality – Product based, User based, Manufacturing based, Value based. Types of quality – Quality of Design, Quality of Conformance, Quality of performance. Quality control and Quality assurance. Factors influencing quality. Reasons for quality evaluation. Terms used in sampling. Fibre sampling from bulk, Fibre sampling from combed slivers, rovings and yarn. Yarn sampling, Fabric sampling.

**UNIT II STATISTICAL EVALUATION 9**

Measures of central tendency and dispersion, Determination of number of tests, Types of error, Sources of error, Design of experiments – Factorial designs, Response surface designs, Taguchi designs. Repeatability, Reproducibility.

**UNIT III FIBRE QUALITY EVALUATION 9**

Measurement of fibre fineness and its importance. Measurement of fibre length and its uniformity. Principles of various fibre testing instruments – High Volume Instrument, Advanced Fibre Information System. Principles of measurement of single fibre fineness, strength and crimp characteristics of man-made fibres – Lenzing Technik's Vibroscope, Vibrodyn, Vibrojet, Vibrotex. Principle of fibre strength measurement by Stelometer, Determination of moisture content and regain in fibres. Innovations in fibre quality evaluation.

**UNIT IV YARN QUALITY EVALUATION 9**

Linear density, Twist, Evenness, Hairiness, Bulk, Friction and Abrasion. Tensile Properties of Yarn, Tensile Testing of Yarn at High Speeds – Uster Tensojet, Lenzing Speedy, Textechno's Statimat, Influence of test speed, specimen length, humidity and temperature on yarn tensile characteristics, Classification of yarn imperfections and faults, Yarn appearance assessment – ASTM yarn grades, Electronic Inspection Board, Latest developments in yarn testing instruments.

**UNIT V FABRIC QUALITY EVALUATION 9**

Tensile strength, Tear strength, Bursting strength, Dimensional stability, Serviceability, Air permeability and Water repellency, Abrasion resistance & Pilling, Colour fastness, Comfort, Objective evaluation of fabric handle, Advances in fabric quality evaluation.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Kothari . V.K,(Ed), Testing and Quality Management, Vol.1, IAFL Publications, New Delhi India, 1999.
2. Saville, B. P, Physical Testing of Textiles, Woodhead Publishing Ltd., England,U.K, 1999.
3. Booth, J.E, Textile Testing, Butterworth Heinemann Ltd., U.K, 1996
4. Basu, A, Textile Testing;- Fibre, Yarn and Fabric, SITRA, Coimbatore, 2001.

**TT3216 STRUCTURE AND PROPERTIES OF FIBRES L T P C  
3 0 0 3**

**UNIT I STRUCTURE OF FIBRES 9**

Basic requirements for fibre formation. Structure of natural and man-made textile fibres – chemical structure, fine structure, and morphological structure of cotton, viscose, acetate, polyester, polyamide, polyacrylonitrile, polyethylene, polypropylene and bast fibres. Basic concepts of intra- and inter-molecular forces, degree of order, degree of orientation of molecular chains, ordered and disordered regions. Models of fibre structure – fringed micelle model, modified-fringed micelle model, fringed fibril model. Similarities and differences amongst the structural features of natural and man-made fibres. Investigation of fibre structure – Electron microscopy, X-ray diffraction methods, Infra-red radiation techniques, density measurement.



4. Meredith. R and Hearle, J.W.S., "Physical Methods of Investigation of Textiles", Wiley Publication, New York, 1989.
5. Morton W.E and Hearle, J.W.S., "Physical Properties of Textile Fibres", The Textile Institute, Manchester,, 2008.

**TC3218**

**WET PROCESSING PREPARATION LABORATORY**

**L T P C  
0 0 3 2**

**LIST OF EXPERIMENTS**

1. Determination of starch content in Enzyme desizing.
2. Determination of residual starch in acid desizing
3. Determination of scouring loss.
4. Bleaching of scoured fabric with hydrogen peroxide.
5. Comparison between bleached and bleached & optical brightened treated sample for whiteness and reflectance value.
6. Determination of the yellowing of hypochlorite bleached (soured/not soured, but washed) fabrics.
7. Effect of time/ temperature in bleaching with hypochlorite (whiteness and strength loss).
8. Effect of pH/ available chlorine in bleaching with hypochlorite (whiteness and strength loss)
9. Scouring & Bleaching of knitted cotton fabrics in winch
10. Scouring & Bleaching of woven blend fabrics in jigger.
11. Bleaching of knitted fabrics in jigger.
12. Degumming & Bleaching of silk.
13. Scouring and Bleaching of wool using hydrogen peroxide.

**TOTAL : 45 PERIODS**

**TC3219**

**TEXTILE PHYSICAL TESTING LABORATORY**

**L T P C  
0 0 3 2**

**LIST OF EXPERIMENTS**

1. Measurement of Fibre Length.
2. Measurement of Fibre Fineness.
3. Determination of yarn count from fabric sample by basely balance.
4. Measurement of a) Linear density of sliver, roving and yarn. b)Single yarn and ply yarn twist.
5. Measurement of Single yarn strength and Lea strength.
6. Measureement of Yarn Impact Strength.
7. Measurement of Fabric thickness, Stiffness and Crease recovery.
8. Measurement of a)Fabric Tensile Strength. b)Fabric Bursting strength
9. Determination of Yarn Crimp.
10. Determination of GSM
11. Determination of twist

**TOTAL : 45 PERIODS**

<b>TT3301</b>	<b>CHEMISTRY OF TEXTILE AUXILIARIES</b>	<b>L T P C</b> <b>3 0 0 3</b>
<b>UNIT I</b>		<b>9</b>
Auxiliaries: Importance and functions; Surfactants: Mode of action and classification of surfactants – cationic, anionic, nonionic and amphoteric surfactants.		
<b>UNIT II</b>		<b>9</b>
Auxiliaries associated with De-sizing, scouring, Bleaching of cellulosic fibres, Protein fibres and synthetic fibres.		
<b>UNIT III</b>		<b>9</b>
Auxiliaries associated with Dyeing with Direct Dyes, Reactive, Vat, Azoic colors, Sulphur dyes, Acid dyes, Metal complex dyes, Basic and Disperse dyes.		
<b>UNIT IV</b>		<b>9</b>
Auxiliaries associated with printing: Direct Style of Printing, Discharge style of Printing, Resist style of printing.		
<b>UNIT V</b>		<b>9</b>
Auxiliaries used in Resin Finishing, Stiff finishing, soft finishing, Water repellent, Water Proof, Flame retardant, Soil release.		

**TOTAL : 45 PERIODS**

**REFERENCES**

1. John Shore, Colourants & Auxiliaries: Wiley and Sons Ltd, New York, Volume I & II, 1999
2. Shennai.V.A, 'Organic Textile Chemicals', Sevak Publication, Bombay, 1995
3. Vaidya.A.A, Chemistry of Textile auxiliaries, Wheeler Publishing, New Delhi, 1999

<b>TC3302</b>	<b>WET PROCESSING MACHINERY</b>	<b>L T P C</b> <b>3 0 0 3</b>
<b>UNIT I</b>	<b>FIBRE AND YARN PROCESSING</b>	<b>9</b>
Classification of Textile processing machinery: Batch – Semi-continuous – Continuous. Yarn – Rope, open width fabric processing machines. Loose stock dyeing machines: types. Yarn Processing: Singeing – Mercerizing. Yarn dyeing machines: Types - HTHP – Cabinet – Package. Dryers: Revolving cabinet - Pressurized package - continuous hank dryer – Radio frequency dryer.		
<b>UNIT II</b>	<b>FABRIC PROCESSING</b>	<b>9</b>
Singeing – Cropping – Shearing. Mercerizing - foam merceriser. J Box – Vapourloc - Semi continuous – Displacement washing - Centrifuging system – Winch: Modifications - Jigger: Jumbo - Universal. Pad dyeing machine: Pad – roll - Pad–batch – Vertical pad – Horizontal pad – Calculation of expression. Continuous dyeing range (CDR) – Thermosol - Beam dyeing - HTHP beam dyeing - Jet dyeing machines: Principle – Fully and partially flooded - Liquor flow – Airflow machine. Soft flow jet dyeing machine.		

**UNIT III PRINTING MACHINES AND DRYERS 9**

Roller printing machinery. Screen printing: Automatic flat bed screen - Rotary screen. Thermo transfer printing machinery. Garment printing machines. Steamers – Agers – Curing process. Extraction of water: Hydroextractors - Cylinder drying - Stenters - High frequency stenter. Float dryers - Hot flue dryers - Perforated drum dryers – Heating systems – Steam – Thermic fluids – Heat requirement.

**UNIT IV FINISHING MACHINES AND WASHERS 9**

Calendars - Sanforizing machines – Raising – Emerising – Crepping. Milling - Crabbing - Decatising. Washing Machines: Mass transfer action – Counter-current - Intensification - Rope washing – Slack, tight water mangles - Suction drum washer - Horizontal washer.

**UNIT V HOSIERY AND GARMENT PROCESSING 9**

Scutcher – Detwisting – Rope piler – Tubular singeing, merceriser - Combined mercerizing and bleaching – Balloon pad – Tubular compacting - Relax dryer. Garment dyeing machinery: Horizontal - Overhead paddle dyeing machine - Rotary dyeing – Jet – Extractors – High temperature machines. Tumbler driers – Garment finishing machines.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Bhagwat R.S., “Hand book of Textile Processing Machinery” Colour publications, Mumbai 1999
2. Cegarra C., Puerte P., Valladperas J., “The Dying of textile Material” Textila Publishers, Italy, 1992.
3. Madaras G.W., Parish G.J., and Shore J., Batchurise dying of woven Cellulosic Fabrics(A Practical Guide) Society of dyers and Colurists Bradford, 1993.
4. Karmakar S R, Chemical Technology in the Pretreatment process of Textiles, Elsevier Publications, 1999.
5. Charles Tomassino, Chemistry and technology of fabric preparation and finishing, North Carolina State University, 1992.

**TC3303 THEORY OF DYEING AND COLOUR PHYSICS L T P C  
3 0 0 3**

**UNIT I 9**

Influence of fibre structure, drawing heat setting and texturizing dyeing behavior. Interaction between dye molecules and polymeric chains if the fibres, Description of monolayer technique and continuous variable method for the identification of dye-fibre bonds. Substantivity and Affinity. Thermodynamic derivations of affinity equations. Kinetic of dyeing. Factors affecting the kinetics of dyeing. Thermodynamic derivations of various absorption isotherms.

**UNIT II 9**

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

**UNIT III 9**

Colour perception, theories of colour vision, colour measurement

**UNIT IV** **9**  
CIE definition of metamerism, Observer metamerism, illuminant metamerism, Geometric metamerism, instrumental metamerism, Dichorism and Non-metameric matches. Visual Photo Electric and Spectro-photometric colorimeter. Variables affecting Visual and Instrumental estimates of colour difference.

**UNIT V** **9**  
Advantages of C.C.M. Application of C.C.M. to Textile processing, Spectral Match and Tristimulus Match. Technique of C.C.M. for Textiles. Single Constant (K/S) K-M theory. Sample preparation in C.C.M., Limitation of C.C.M. technique, Shade sorting.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Peters.A.T and Freeman,H.S 'Analytical Chemistry of Synthetic Colorants', Blackie, ISBN 0751402087.1991
2. Peters.A.T and Freeman,H.S 'Physico – Chemical Principles of Colour Chemistry', Blackie, ISBN :0751402109.1995
3. Johnson,A, 'The Theory of Colouration of Textiles', SDC 2<sup>nd</sup> Edition,1998

**TC3304** **DYEING OF CELLULOSIC TEXTILES – I** **L T P C**  
**3 0 0 3**

**UNIT I** **9**  
Historical background of Dyeing of Textile Fibres, Basic concept of dye and pigment, Definition of affinity, substantivity, reactivity, exhaustion, depth of dyeing, percentage shade. Concepts of exhaust and padding techniques of dyeing. Basic mechanisms of dyeing techniques such as mechanical deposition, chemical fixation. Classification of dyes according to methods of application. Influence of pretreatment on dyeing properties.

**UNIT II** **9**  
Direct dyes: General properties, principles and method of application on cellulosic materials. Classification dyeing of cellulosic materials. Various after treatments to improve the wash fastness and light fastness. Practical problems and their remedies.

**UNIT III** **9**  
Reactive dyes – Chemistry, concept of hot brand, cold brand, HE and vinyl sulphone reactive dyes, bifunctional and low salt reactive dyes, principle steps involved in dyeing of cellulosic materials. Practical problems remedy.

**UNIT IV** **9**  
Vat dyes : Chemistry and general properties classification. Principle steps involved in dyeing. Various methods of application of on cellulosic yarn and fabric with vat dyes. Stripping practical problems – dyeing and remedies.

**UNIT V** **9**  
Solubilised vat dyes: Chemistry and general properties – Principles steps involved in dyeing of cellulosic materials. Practical problems and their remedies. Selection of dyes for the dyeing of different cotton materials.

**TOTAL : 45 PERIODS**

## REFERENCES

1. Shore, J. "Blend Dyeing", SDC, London, 1998 ISBN: 0901956740.
2. Madaras, G.W., Parish, G.J., and Shore, J., "Batchwise dyeing of woven cellulosic fabrics", SDC, London, 1993, ISBN: 0901956554.
3. Shore, J. "Cellulosic Dyeing", SDC Publication, London, 1995 ISBN: 0901956686.
4. Shenai V.A. "Technology of Dyeing" 1995, Sevak Publications, Mumbai.
5. Chakraborty, J.N, Fundamentals and Practices in colouration of Textiles, Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3

**TC3305**

**DYEING OF PROTEIN TEXTILES**

**L T P C**  
**3 0 0 3**

### **UNIT I**

**9**

Pretreatment: Chemical composition of wool – Scouring of wool – Scouring in the form of loose wool, yarn and fabric – Milling, Grabbing and potting. Bleaching of wool – Carbonizing of wool – Chemical composition of silk – Degumming of silk with alkalis, Organic acid, organic amines and enzymes. Machines for degumming of silk yarn and fabrics. Bleaching of silk with reducing and oxidizing bleaching agents.

### **UNIT II**

**9**

Acid Dyes: Types based on application – Properties - Effect of electrolyte, temperature, time, pH and other dye bath assistants on dyeing of protein fibres Importance of isoelectric point in dyeing of protein fibres. Mechanism of dyeing protein fibres. Application procedure for dyeing of wool, silk, stripping and re-dyeing.

### **UNIT III**

**9**

Reactive Dyes: Types of reactive dyes used for dyeing protein fibres – Type of chemical reactions involved in dyeing of wool and silk with reactive dyes – application of monochloro, dichloro triazine dyes on wool and silk – application of vinyl sulphone, difluoro, mono chloro primidyl dyes, bromo acrylamide dyes and bifunctional dyes on wool and silk. Striping and redyeing.

### **UNIT IV**

**9**

Natural Dyes: Need for natural dyes – properties – classification – direct substantivity of – dyes with mordants – role of mordants – mordants suitable for protein fibres – dyeing of silk and wool with yellow dyes using turmeric, kamala, tesu, marigold, larkspur, dolu etc. Red dyes using safflower, manjit, patang and lac. Blue dyes using indigo. Black dyes using log wood. Advantages and drawbacks of natural dye. Striping and re-dyeing.

### **UNIT V**

**9**

Basic Dyes: Dyeing mechanism with protein fibres – application procedure of silk and wool mechanism of dyeing silk and wool with metal complex dyes – properties of chrome dyes – application procedure – chrome mordant, meta chrome and after chrome methods. Dyeing of wool with solubilised vat dyes.

**TOTAL : 45 PERIODS**

## REFERENCES

1. Bona, M., "An Introduction to Wool fabric finishing", The Textile Inst, Manchester, 1994, ISBN: 187081259X.
2. Lewis, D.M., (Ed), "Wool dyeing", SDC, London, 1992, ISBN: 0901956538.
3. Brady, P.R., and Angliss, I.B., "Wool printing and wool dyeing", Textile progress, Vol.12, No3, The Textile Institute, Manchester, 1982, ISBN: 0900739614.
4. Gulrajani, M.L., and Gupta, S., "Wool dyeing and printing", IIT, New Delhi, 1990.
5. Gulrajani, M.L., "Chemical Processing of Silk", IIT, New Delhi, 1991.
6. Chakraborty, J.N, Fundamentals and Practices in colouration of Textiles, Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3

**TC3306**

**TECHNOLOGY OF PRINTING – I**

**L T P C  
3 0 0 3**

### **UNIT I**

**9**

Definition of printing – Difference between printing and dyeing – Pretreatment and Fabric requirements for printing – Design details of printing like repeat of design, squeegees, bolting cloth – Ingredients in printing with functions and their concentration of usage – Classification thickeners – Requirements to be a good thickener – Brief study on thickeners like CMC, Sodium Alginate, Indalca, Guar gum and Kerosene emulsion paste – Synthetics thickeners.

### **UNIT II**

**9**

Printing with Pigments, Classification of pigments, Synthetic binders, Catalyst, Cross Linking agents. Selection criteria for binders. Pigment printing of PET and blends. Printing with reactive dyes by steaming method, curing and silicate padding method – Advantages and Disadvantages of above methods – Printing with Rapid fast and Rapidogen colours, Printing with solubilised Vat dyes.

### **UNIT III**

**9**

Colour and White Discharge of cotton and viscose dyed materials – Problems associated with Discharge style printing. Brief study on Discharging agents and their usage and limitations of usage, Different styles of Resist printing of cellulose materials.

### **UNIT IV**

**9**

Preparation of knits and garments for printing, Khadi and Colour Khadi print, Plastic and Rubber print, Gold and Silver Prints on Hosiery by direct style method – Flock printing on Hosiery.

### **UNIT V**

**9**

A brief study on traditional methods of printing such as Tie and Dye style, Batik printing, IKAT Printing, Burnt out style printing, speckle printing. Crepon style of printing, conversion style of discharge printing.

**TOTAL : 45 PERIODS**

## REFERENCES

1. Mills I.W.C. 'Textile Printing' SDC Perkin House, 82, Grattom Rd, Yorkshire, England.1994, ISBN 0901956570.
2. Storey, J. "Manual of Textile Printing", Thames & Hudson, 1992, ISBN: 0500680280.
3. Kale D.G. "Principles of Cotton Printing edition – 2", Mahajan Books, Ahemedabad. 1979
4. 4. Shenai V.A. "Technology of Textile Processing Vol. IV" 1998, Sevak Publications, Mumbai.
5. Chakraborty, J.N, Fundamentals and Practices in colouration of Textiles, Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3

**TC3308**

**DYEING OF CELLULOSIC TEXTILE LABORATORY**

**L T P C  
0 0 3 2**

### **S.No List of Experiments**

1. Dyeing of cotton fabric with direct dyes.
2. Dyeing of cotton fabric with Azoic.
3. Dyeing of cotton fabric with Sulphur Colours and after treatments.
4. Dyeing of cotton fabric with Vat dyes.
5. Dyeing of cotton fabric with Cold Brand Reactive dies.
6. Dyeing of cotton fabric with Hot Brand Reactive dyes.
7. Dyeing of cotton fabric with Remazol dyes.
8. Dyeing of cotton fabric with pigments colours using padding method.
9. Dyeing with Cold Brand Reactive dyes on Jigger.
10. Dyeing with Remazols by Pad – Steam method.
11. Dyeing with Remazols by Pad – silicate method.
12. Dyeing with Procion HE dyes on Winch – Hosiery fabrics
13. Stripping and Redyeing of Faulty dyeing (Azoic)
14. Stripping and Redyeing of Faulty dyeing (Reactive)
15. Effect of liquor ratio on the dyeing of cotton with direct dyes.
16. Effect of temperature on the dyeing of cotton with direct dyes.
17. Effect of salt on the dyeing of cotton with direct dyes.
18. Effect of time on the dyeing of cotton with direct dyes.

**TOTAL : 45 PERIODS**

**TC3309**

**DYEING OF PROTEIN TEXTILE LABORATORY**

**L T P C  
0 0 3 2**

### **S.No Experiments**

1. Dyeing of Wool with Direct Dyes.
2. Dyeing of Wool with Basic Dyes.
3. Dyeing of Wool with Metal Complex Dyes.
4. Dyeing of Wool with Acid Dyes.
5. Dyeing of Wool with Natural Dyes.

6. Dyeing of Wool with Reactive Dyes.
7. Striping and re-dyeing of wool.
8. Dyeing of silk with Direct Dyes.
9. Dyeing of silk with Basic Dyes.
10. Dyeing of silk with Metal Complex Dyes.
11. Dyeing of silk with Acid Dyes.
12. Dyeing of silk with Acid Dyes.
13. Dyeing of silk with Reactive Dyes
14. Striping and re-dyeing of silk.
15. Effect of pH on dyeing of wool/silk with acid dyes.
16. Effect of Electrolyte on dyeing of wool/silk with acid dyes.
17. Effect of Temperature on dyeing of wool/silk with acid dyes.
18. Effect of Liquor ratio and Time on dyeing of wool/silk with acid dyes.
19. Effect of Time on dyeing of wool/silk with acid dyes.

**TOTAL : 45 PERIODS**

**TC3310**

**SHADE MATCHING AND QUALITY CONTROL**

**L T P C  
0 0 3 2**

### **Shade Matching**

#### **S.No Experiments**

1. Self shade card preparation with direct dyes.
2. Self shade card preparation with Reactive Cold Brand dyes.
3. Self shade card preparation with Reactive Hot Brand dyes
4. Self shade card preparation with Reactive Vinyl Sulphone dyes
5. Preparation of compound shades using binary colours of Reactive Hot Brand Dyes
6. Preparation of compound shades using tertiary colours of Reactive Remazol Dyes
7. Matching of compound shades using binary colours of Reactive Hot Brand Dyes
8. Matching of compound shades using tertiary colours of Reactive Remazol Dyes
9. Prediction of recipe using computer colour matching system
10. Correction recipe predication from computer clolour matching
11. Measurement of delta-E

### **Quality Control**

#### **S.No Experiments**

1. Absorbency test of scoured fabric.
2. Determination of different whiteness indices, yellowing indices of the bleached fabric.
3. Wash fastness of dyed/printed samples.
4. Light fastness of dyed/printed samples.
5. Rubbing fastness of dyed/printed samples.
6. Perspiration fastness of dyed/printed samples.
7. Chlorine fastness of dyed/printed samples.( Spot Test)

**TOTAL : 45 PERIODS**

Globalisation has brought in numerous opportunities for the teeming millions, with more focus on the students' overall capability apart from academic competence. Many students, particularly those from non-English medium schools, find that they are not preferred due to their inadequacy of communication skills and soft skills, despite possessing sound knowledge in their subject area along with technical capability. Keeping in view their pre-employment needs and career requirements, this course on Communication Skills Laboratory will prepare students to adapt themselves with ease to the industry environment, thus rendering them as prospective assets to industries. The course will equip the students with the necessary communication skills that would go a long way in helping them 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.

<b>I. PC based session</b>	<b>(Weightage 40%)</b>	<b>24 periods</b>
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**A. ENGLISH LANGUAGE LAB (18 Periods)****1. LISTENING COMPREHENSION: (6)**

Listening and typing – Listening and sequencing of sentences – Filling in the blanks - Listening and answering questions.

**2. READING COMPREHENSION: (6)**

Filling in the blanks - Close exercises – Vocabulary building - Reading and answering questions.

**3. SPEAKING: (6)**

Phonetics: Intonation – Ear training - Correct Pronunciation – Sound recognition exercises – Common Errors in English.

Conversations: Face to Face Conversation – Telephone conversation – Role play activities (Students take on roles and engage in conversation)

**B. DISCUSSION OF AUDIO-VISUAL MATERIALS (6 PERIODS)**

**(Samples are available to learn and practice)**

**1. RESUME / REPORT PREPARATION / LETTER WRITING (1)**

Structuring the resume / report - Letter writing / Email Communication - Samples.

**2. PRESENTATION SKILLS: (1)**

Elements of effective presentation – Structure of presentation - Presentation tools – Voice Modulation – Audience analysis - Body language – Video samples

3. **SOFT SKILLS:** (2)  
Time management – Articulateness – Assertiveness – Psychometrics – Innovation and Creativity - Stress Management & Poise - Video Samples
4. **GROUP DISCUSSION:** (1)  
Why is GD part of selection process ? - Structure of GD – Moderator – led and other GDs - Strategies in GD – Team work - Body Language - Mock GD -Video samples
5. **INTERVIEW SKILLS:** (1)  
Kinds of interviews – Required Key Skills – Corporate culture – Mock interviews-Video samples.

<b>II. Practice Session</b>	<b>(Weightage – 60%)</b>	<b>24 periods</b>
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1. **Resume / Report Preparation / Letter writing:** Students prepare their own resume and report. (2)
2. **Presentation Skills:** Students make presentations on given topics. (8)
3. **Group Discussion:** Students participate in group discussions. (6)
4. **Interview Skills:** Students participate in Mock Interviews (8)

#### TEXT BOOKS

1. Anderson, P.V, **Technical Communication**, Thomson Wadsworth, Sixth Edition, New Delhi, 2007.
2. Prakash, P, **Verbal and Non-Verbal Reasoning**, Macmillan India Ltd., Second Edition, New Delhi, 2004.

#### REFERENCES

1. John Seely, **The Oxford Guide to Writing and Speaking**, Oxford University Press, New Delhi, 2004.
2. Evans, D, **Decisionmaker**, Cambridge University Press, 1997.
3. Thorpe, E, and Thorpe, S, **Objective English**, Pearson Education, Second Edition, New Delhi, 2007.
4. Turton, N.D and Heaton, J.B, **Dictionary of Common Errors**, Addison Wesley Longman Ltd., Indian reprint 1998.

#### LAB REQUIREMENT

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

## REQUIREMENT FOR A BATCH OF 60 STUDENTS

Sl.No.	Description of Equipment	Quantity required
1.	<b>Server</b> <ul style="list-style-type: none"> <li>○ PIV system</li> <li>○ 1 GB RAM / 40 GB HDD</li> <li>○ OS: Win 2000 server</li> <li>○ Audio card with headphones (with mike)</li> <li>○ JRE 1.3</li> </ul>	1 No.
2.	<b>Client Systems</b> <ul style="list-style-type: none"> <li>○ PIII or above</li> <li>○ 256 or 512 MB RAM / 40 GB HDD</li> <li>○ OS: Win 2000</li> <li>○ Audio card with headphones (with mike)</li> <li>○ JRE 1.3</li> </ul>	60 No.
3.	Handicam Video Camera (with video lights and mic input)	1 No.
4.	Television - 29"	1 No.
5.	Collar mike	1 No.
6.	Cordless mikes	1 No.
7.	Audio Mixer	1 No.
8.	DVD Recorder / Player	1 No.
9.	LCD Projector with MP3 /CD /DVD provision for audio / video facility - <b>Desirable</b>	1 No.

- UNIT I** **9**  
 Commercial importance of finishing and its classification. Resin finishing: Mechanism of creasing, Types of Resins .Anti crease, wash and wear, durable press resin finishing. Causes & remedies of strength losses of Resin finished fabric. Mechanism of Chlorine retention. Formaldehyde Release from Resin finished goods. Study about eco friendly method of anti crease finishing. Polycarboxilic acids for crease recovery finish.
- UNIT II** **9**  
 Concept of Flame proof & flame retardancy. Concept of pyrolysis, Flame retardant finishes for cotton, Concept of waterproof and water repellent Finishes, Mildew proof finishes and Rot proof finishing. Durable & Semi durable and Temporary finishes, Anti microbial, Deodorant, Perfume, UV Protection finishes.
- UNIT III** **9**  
 Soil Release Finishing: Mechanism of soil retention & soil release. Various soil releases finishes for cotton, Polyester and its blends. Detail study of antistatic finishes. Ant pilling Finishing: chemical and mechanical methods to produce antipilling finish.
- UNIT IV** **9**  
 Detail study about mechanical finishing of textile materials like calendaring, compacting, raising, Sanforising, Beach finishing. Object of Heat setting. Various methods of heat setting and mechanism of heat setting. Foam Finishing: Detailed study of various techniques of foam application. Drawbacks of foam finishing.
- UNIT V** **9**  
 Mechanism in the weight reduction of PET by using alkali ; Micro encapsulation techniques in finishing process, Detail study of the process to produce silk like Polyester. Study about cationic, reactive and silicon emulsion softeners. Brief study about stiffening of textile materials, Nano finish, Self cleaning finish.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Lewin & Sello, Functional finishes, Part A & Part B; CRC Press ISBN:0824771184, 1994
2. Microencapsulation in finishing, Review of progress of Colouration, SDC, 2001
3. Perkins, W.S., "Textile colouration and finishing", Carolina Academic Press., U.K, ISBN: 0890898855.2004
4. Fiscus, G., and Grunenwald, D., "Textile finishing : A complete guide", High Tex, Blackwells Bookshop, Leeds, U.K. 1999
5. Chakraborty, J.N, Fundamentals and Practices in colouration of Textiles, Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3

**TC3312**

**DYEING OF SYNTHETIC TEXTILES**

**L T P C**

**3 0 0 3**

**UNIT I**

**9**

Mass Colouration of Polyester, Nylon, Acrylic and polypropylene, Advantages & Disadvantages of Mass Colouration; Difference between Mass Colouration and Dyeing.

**UNIT II**

**9**

Polyester Dyeing: carrier, HTHP and thermosol methods of dyeing. CD polyester dyeing, micro denier PET dyeing. Practical problems and their solutions. Stripping of dyed PET

**UNIT III**

**9**

Dyeing of Polyester Blends: Various shop floor practices of dyeing of polyester/cellulosic-blended fabrics. Practical problems and their solutions.

Various shop floor practices of dyeing of polyester/wool blended fabrics. Practical problems and their solutions. Dyeing of polyester with cationic dyes. Dyeing of Micro polyester fabric and its blends. Practical problems in dyeing.

**UNIT IV**

**9**

Dyeing of nylon. Dyeing with acid dyes-High temperature dyeing. Low temperature dyeing of Nylon 66 – Dyeing with disperse dyes. Barriness of dyeing – Dyeing of polyamide cellulosic blends – polyamide/wool blends, polyamide/ polyester blends-Stripping of Nylon dyed material. Practical problems and remedies in Nylon Dyeing. Dyeing of unmodified and modified polypropylene.

**UNIT V**

**9**

Dyeing of Acrylic Fibres: – Dyeing with cationic dyes – Effect of fibre saturation value, pH- Cationic, Anionic and polymeric retarder systems –stripping of cationic dyes, dyeing with disperse dyes, dyeing of acrylic blends, differentially dyeable acrylic fibres.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Gulrajani, M.L., "Polyester Dyeing", IIT, New Delhi, 2001
2. Vaidya, A.A., and Datye, K.V., "Chemical processing of Synthetic Fibres and Blends", John Wiley and Sons, New Delhi, 1995
3. Shore, J. "Blend Dyeing", SDC, London, ISBN: 0901956740. 1998
4. Chakraborty, J.N, Fundamentals and Practices in colouration of Textiles, Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3

**TC3313**

**DYEING OF CELLULOSIC TEXTILES- II**

**L T P C**

**3 0 0 3**

**UNIT I**

**9**

Sulphur dyes – Chemistry and general properties of sulphur dyes. Principle steps involved in sulphur dyeing. Shop floor practices of dyeing of cellulosic materials with sulphur dyes. Stripping of sulphur dyes. Practical problems and their remedies.

**UNIT II**

**9**

Azoic colours – Chemistry and general properties of Azoic colours – Concept of naphthols and bases. Principle steps involved in Azoic dyeing. Various shop floor practices of dyeing of cellulosic materials with. Azoic colours. Novel approaches to improve rubbing fastness of azoic dyed goods. Tub-liquoring techniques. Practical problems and remedies.

**UNIT III** **9**  
Dyeing of Indigo (synthetic indigo. Dyeing of cellulose materials with phthalogen blue, mineral khadi, aniline black, pigments, dyeing of Jute and other vegetable fibres.

**UNIT IV** **9**  
Natural Dyes: Classification of natural dyes. Different application methods of natural dyes. Advantages and disadvantages of using natural dyes. Future of natural dyes

**UNIT V** **9**  
General idea about water, steam and electricity consumption in dyeing department and various measures to reduce the consumption of water, steam and electricity.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Shore, J. "Blend Dyeing", SDC, London, ISBN: 0901956740. 1998
2. Shore, J. "Cellulosic Dyeing", SDC, London, ISBN: 0901956686. 1995
3. Shenai V.A. "Technology of Dyeing", Sevak Publications, Mumbai. 1995
4. Chakraborty, J.N, Fundamentals and Practices in colouration of Textiles, Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3

**TC3314** **TECHNOLOGY OF PRINTING- II** **L T P C**  
**3 0 0 3**

**UNIT I PRINTING OF POLYESTER** **9**  
Preparation of cloth for printing, paste formulation, selection criteria of dyes, Direct, Discharge and Resist styles of printing. Mechanism and the chemistry of various discharging and resisting chemicals used. Fixation and after treatments.

**UNIT II PRINTING OF POLYAMIDES AND ACRYLICS** **9**  
Preparation of cloth for printing, paste formulation, printing of polyamide with acid, disperse, metal complex dyes. Printing of acrylics with disperse and cationic dyes. Direct, discharge and resist styles of printing.

**UNIT III PRINTING OF SILK AND WOOL** **9**  
Preparation of silk cloth for printing, paste formulations, printing of silk with various classes for dyes. Direct, discharge and resist styles of printing. Preparation of wool cloth for printing, paste formulations. Direct, discharge and resist styles of printing on woolen materials.

**UNIT IV PRINTING OF BLENDED FABRICS** **9**  
Preparation of blended fabrics like Polyester/Cellulose, Polyester/Wool for printing. Various styles of printing on above blended materials. Single dye application on blended fabrics, Process and quality control during printing. Borasso Prints and details for P/C blends.



## REFERENCES

1. Ramachandra Aryasri A and Ramana Murthy V, "Engineering Economics and Financial Accounting", Tata McGraw Hill Publishing Company Limited , New Delhi, 2006.
2. Kesavan R, Elanchezian C and Sunder Selwyn T, Engineering Economics and Financial Accounting" Laxmi Publication (P) Ltd , New Delhi, 2005.
3. Maheswari S N, "Financial and Management Accounting", Sultan Chand & Sons New Delhi, 1999.

**TC3317**

**DYEING OF SYNTHETIC TEXTILE LABORATORY**

**L T P C  
0 0 3 2**

### **S.No Experiments**

1. Effect of water hardness & pH in dyeing of polyester with disperse dyes.
2. Dyeing of Polyester using carriers.
3. Dyeing of Polyester by HTHP methods.
4. Carrier dyeing of Polyester/Cotton blended fabrics in laboratory jigger machine.
5. Exhaust dyeing of Polyester/Cotton blended fabrics with disperse/reactive system.
6. Exhaust dyeing of Polyester/Cotton blended fabrics with disperse/vat system.
7. Dyeing of Polyester /Cotton blended fabrics with pigments
8. Exhaust dyeing of Polyester/Viscose blended fabrics with disperse/reactive system.
9. Exhaust dyeing of Polyester/Viscose blended fabrics with disperse/vat system.
10. Dyeing of Polyester/Wool blended fabrics using disperse/acid system.
11. Dyeing of Polyester/Wool blended fabrics using disperse/basic system.
12. Dyeing of Polyester/Wool blended fabrics using disperse/metal complex dyes.
13. Dyeing of micro denier polyester fabric in winch machine.
14. Matching of shades with the help of computer colour matching system.
15. Dyeing of acrylic fibre with cationic dyes.
16. Dyeing of Nylon fabrics

**TOTAL : 45 PERIODS**

**TC3318**

**TEXTILE PRINTING LABORATORY**

**L T P C  
0 0 3 2**

### **S.No Experiments**

1. Direct style of printing using hot brand reactive dyes.
2. Direct style of printing using Vinyl Sulphone dyes,
3. Direct style of printing using Pigment Dyes on cotton and P/C Blend.
4. Direct style of printing using Disperse Dyes.
5. Direct style of printing using Vat Dyes.

6. Direct style of printing with Solubilised Vat dyes.
7. Direct style of printing with Khadi on Hosiery.
8. Plastic print on hosiery fabrics.
9. Foam print of hosiery fabrics.
10. Silver print on hosiery fabrics.
11. Gold print on hosiery fabrics.
12. Tie and Dye style of printing on cotton fabrics
13. Batik styles print on cotton fabrics.
14. White Discharge on Reactive ground.
15. Colour Discharge on Reactive ground.
16. Burn out style printing.

**TOTAL : 45 PERIODS**

**TC3319**

**TEXTILE FINISHING LABORATORY**

**L T P C  
0 0 3 2**

**S.No Experiments**

1. Finishing the given fabric using 2 % starch.
2. Finishing the given fabric using 2 % softener
3. Buckram finish the given fabric sample using a suitable recipe.
4. Finish the sample using the given resin.
5. Giving water repellent Finish to the given fabric sample.
6. Finding the warp wise / weft wise shrinkage of the given fabric sample.
7. Crease recovery finishing of cotton.
8. Crease recovery finishing of P/C blends.
9. Comparison of different resins for crease recovery finishing of cotton.
10. Weight reduction of polyester.
11. Carbonisation of P/C blends.
12. Scroopy finish for silk.

**TOTAL : 45 PERIODS**

**TC3401**

**WATER AND EFFLUENT TREATMENT AND  
POLLUTION CONTROL**

**L T P C  
3 0 0 3**

**UNIT I**

Impact of man on the Environment – an over view of Urbanization and Biodiversity. Environmental pollution – classification of pollution – Effect of industrial effluents – a detailed study of effluents discharged by (A) Soap and detergent manufacture industry (B) Synthetic resin manufacture industry (C) Textile processing industry (D) Viscose, Rayon manufacture industry – (Study includes origin of effluent, important characteristic and general mode of treatment) (D)Dyes and Auxiliary manufacturers.

**UNIT II** **9**

Constituents of water and their effect on Textile wet processing – Water pollution – wastes that contribute to water pollution – Harmful effects of water pollution and source of water pollution and source of water pollution – Traditional types of water pollution, programmes which includes WHO, ISO standards for raw water criteria – A general study on raw water pollution and consequence of River water pollution – Effluent discharge standards for inland surface water public sewers, on land for irrigation, marine coastal areas and drinking water parameters – Quality requirements of water for cotton and synthetic Textile processing – A general study on Boiler water requirements which includes problem caused by water and effects and feed water requirements for low and medium pressure boilers and at a pressure of 450 – 500 PSI.

**UNIT III** **9**

Removal of colour and turbidity (simple Coagulation, Flocculation and Filtration methods), General study on removal of Iron and Manganese by Aeration, settling and filtration method – Water softening – study includes Cation Exchange softening, lime soda softening, softening by sequestering agents and de-mineralization with schematic diagram of removal of carbon di oxide and silica – Water analysis & methods Colour, pH value, dissolved solids, suspended solids, total hardness (Calcium + Magnesium). EDTA Tetrometric method, total iron-thiocyanate method, Determination of Alkalinity by Titrimetric method – Determination of chlorides by silver nitrate method – Determination of dissolved oxygen by iodimetry method – Determination of surfactants (anionic) by longwell ethylene blue method. Test for corrosivity by Marble test method, Determination of BOD, COD, TDS and Toxicity.

**UNIT IV** **9**

Effect of effluents – General treatment procedure parameters to be determined at Sizing, Desizing, Kier boiling, Bleaching, Mercerizing, Dyeing, Printing, Combined effluent treatment of industrial of waste – Brief study on Screening, Sedimentation, Equalization, Neutralisation, Coagulation, Secondary treatment – Trickling filtration Activated sludge process, oxidation ponds, Anaerobic Digestion, Tertiary treatment – Evaporation (solar and steam). Reverse osmosis, ion exchange, chemical precipitation and removal by Algae and activated carbon treatment. Model schematic diagram for – Wastewater treatment plant for textile mills – Primary and Secondary units & Tertiary treatments, Quality parameters at entry and exit of RO.

**UNIT V** **9**

Air Pollution – Gaseous and Aerosols – Effects of air pollution – Effect of Sulphur oxide on human health – Properties of air pollutants – control of air pollutants – Air pollution control equipment – Ambient air quality standards – Emission limits at chimney level – Noise pollution – Types of noise (Steady state noise – Impulse noise) – ill effects of noise – Noise measurement – Control of noise pollution – Shape noise levels in decibels.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Reife, A., and Freeman, H.S., (Ed)., "Environmental chemistry of dyes and pigment", Wiley., London, 2000, ISBN: 047158276.
2. Rao, C.S., "Environment Pollution control Engineering", New age International Ltd. and Publishers, N.Delhi, 2004.
3. Horrockks, A.R (Ed)., "Ecotextiles'98: Sustainable development", The Text.Inst., Manchester 1999, ISBN: 1855732426.
4. Modak.P., "The textile industry and the environment", UNEP:HMSO, Blackwells, Leeds, 2003, ISBN: 9280713671

**UNIT I****9**

**HRD:** Management task of HRD – Social interest and relevance – Improving the working conditions (case studies) – Improving productivity (case studies) – Attention to human needs (case studies) – Role of personnel manager – Selection process – Induction process – Personnel appraisal – Reward systems – Training programmes (Case studies) – Role of HRD manager.

**UNIT II****9**

**TQM:** Tools and techniques – Motivation of workers – Customer focus-emphasis on team work – Emphasis on competitive spirit – concepts of quality circles – Improvement in performance of the company and quality of group behaviour through quality circles - decision making process – Approach to TQM in Textile Industry (Case studies) Facing internal and external competition (case studies) – work culture change through TQM – Top management perspective – Accomplishment of objectives.

**UNIT III****9**

**INDUSTRIAL ENGINEERING:** Job evaluation and job description in textile mills (categories of workmen duties and responsibilities) Spinning – weaving – knitting – chemical processing – garment industry – work norms – time study and other work measurement techniques – concept of performance rating – relaxation and other allowances – Time element sheets – Methods and mathematical models for assessing work norms in textile mills. Including minimum cost allocation. Productivity measurement in textile mills. Organization and method studies – analysis and planning of systems and procedures – form design and control – records management – automation in office wage systems in textile mills – apprenticeship – stipend – time rate system - piece rate system. SAP, MIS, ERP, BIS, ISO etc.

**UNIT IV****9**

**Energy Conservation:** Case studies

**Machinery Maintenance:** Maintenance schedules – Maintenance cost.

**UNIT V****9**

**Taxation:** Principles of direct and indirect taxation – Income tax for local market and exports – Sales tax – CST – Central excise.

**Modvat & Cenvat** – Customs duty – Rates of taxes applicable to textile mills.

Eco-Auditing and Eco-Labeling: Norms & Procedures.

**TOTAL : 45 PERIODS****REFERENCES**

1. Dudeja V D "Management of Textile Industry", Textile Trade Press – Ahemadabad 1990.
2. Ormenod A "Textile Product Management", The Textile Institute, Manchester 1992.
3. "Norms of Textile Industries", Pub. By ATIRA, BTRA, NITRA, SITRA 1988.
4. "Handbook of Import and Export Procedure", Government of India.

- UNIT I** **9**  
Visible spectrometry, UV-VIS Spectrophotometry and Colorimetry – Theory, Deviations from Beer's Law, Instrumentation (Line diagram alone) and application. Ultra violet spectroscopy – Theory, instrumentation and application – Quantum description, Instrumentation, Chemical shift, applications and limitations.
- UNIT II** **9**  
Infra red spectroscopy, FTIR, ATR-FTIR – Theory, Fundamental Vibrations, Overtones, Hook's Law. Instrumentation, Single and Double beam spectrometers, Application and Limitations, Difference between Raman spectra and IR spectra. Mass spectroscopy – Theory, Spectrometers, Interpretation, some examples, applications and limitations, X-Ray Photo electron spectroscopy (XPS).
- UNIT III** **9**  
Conduct metric measurements – Important Laws, Definitions, conductance measurements, applications, Types, advantages and disadvantages of Conduct metric titration's.  
Potential measurements, pH determination, Ion selective electrodes, Application of pH measurements, (pH paper, solution) Type of potentiometer titration's advantages, pH Buffers and standardization.  
Thermal methods – Thermogravimetry, differential Thermal analysis, Thermometric titration's and their applications.
- UNIT IV** **9**  
Chromatographic techniques – Introduction and classification. Theory, Instrumentation and Application of Paper chromatography, Thin Layer Chromatography, Column Chromatography, Gas Chromatography, High performance liquid Chromatography, Gas-Liquid Chromatography.
- UNIT V** **9**  
Errors, Precision and Accuracy: Definitions, Significant figures, Types of errors, Methods of expressing accuracy and precision, confidence limits.

**TOTAL : 45 PERIODS**

**REFERENCE BOOKS**

1. Bona, M., "Modern control Techniques in textile finishing and making up", Eurotex, Blachwells Bookshop, London, 2001
2. Banwell, G.C., "Fundamentals of molecular spectroscopy", TMH, 2003.
3. Day, R.A., and Unerwood, A.L., "Qualitative inorganic analysis, 5<sup>th</sup> edition", Prentice-Hall of India, New Delhi, 2004.
4. Rouessac, F., "Chemical analysis – modern international method and techniques", Wiely, New Delhi, 1999.

**UNIT I****9**

Definition of Process control and Quality control – Need for quality control in textile wet processing – Flow charts indicating Process control and Quality control tests to be carried out in Desizing, Scouring, Bleaching, Souring, Mercerizing, Dyeing, Printing and finishing – Identification and estimation of residual starch – Determination of weight loss during Desizing and Scouring – Estimation of Residual Wax content and Total wax content by Soxhlet extraction method – Estimation of Copper number – Determination of Cuprammonium fluidity – Determination of Acid groups by methylene blue absorption method – Absorbency tests by Drop test method and wicks method.

**UNIT II****9**

Determination of ash content – Determination of Whiteness and Whiteness retention – Determination of Barium Activity number – Shrinkage of fabric – Determination of Light fastness by xenon Arc lamp – Determination of fastness to Washing – Determination of fastness to Dry and Wet rubbing – Determination fastness to Alkaline and Acidic Perspiration – Determination fastness to Hot pressing – Determination fastness to Dry cleaning and sublimation.

**UNIT III****9**

Determination of efficiency of Water Proofing – Determination of efficiency of Flame Proofing – Determination of efficiency of Starching, by Bending length method – Determination of efficiency of Resin finishing by CRA. Estimation of residual formaldehyde present in resin finished fabric. Evaluation of efficiency of wetting agent by Sinking Time method – Evaluation of Dispersing agent – Evaluation of efficiency of detergents by Foam stability test – Identification of various fibres like Cotton, Viscose, Polyester, Wool, Acrylic and Nylon – Quantitative and Qualitative analysis of mixtures of blends like P/C, P/V, Acrylic/Cotton, Cotton/Viscose/Wool and Nylon/Acrylic/Cotton.

**UNIT IV****9**

Estimation of Purity of dyes by Dyeing Trails and by using Spectrophotometer. Concept of Computer Colour matching – Advantages of Computer colour matching system and its limitations – Working principle of computer colour matching – Estimation of purity of Sodium Hydrosulphite, Sodium Nitrite, Sodium silicate – Estimation of strength of Hydrogen peroxide, Estimation of available Chlorine in Hypochlorite solution. Identification of dyes on Cellulose fibre, Protein fibre and synthetic fibre.

**UNIT V****9**

Necessary of Eco-friendly processing – Concept of Eco-Friendly processing – The German Ban – List of banned Amines and Chemicals – Alternatives – Eco-labelling. – Tolerance limits of chemicals and auxiliaries in the export fabrics – Possible sources of contamination of red listed chemicals – ISO 14000 certification. Brief mention about the instruments used for measuring the various eco-parameters.

**TOTAL : 45 PERIODS****REFERENCES**

1. Vaidya A.A. and Datye, K.K “Chemical processing of synthetic and blends”, John Wiley and Sons, New York, 1995.
2. Shenai V.A. – Technology of Textile Processing, Vol.8 Evaluation of Textile Chemicals, Edn.3, Sevak Publications, Mumbai 1995.
3. Indian Standard Institution (Delhi) – ISI Handbook of Textile Testing, Indian Standards Inst., New Delhi, 2004
4. AATCC Technical manual, 2008 Association of Textile chemists and Colorists. USA.
5. Orientation Programme on Wet Processing-Quality & Process Control, BITRA Publications. 1986

**TC3407**

**PRODUCT DEVELOPMENT LABORATORY**

**L T P C  
0 0 3 2**

**S.No Experiments**

1. Development of Low temperature peroxide bleaching in soft flow
2. Development of combined desizing and scouring using bio technology
3. Development of dyeing of cotton fabric with Jigger
4. Development of dyeing of cotton fabric with Winch
5. Development of one bath dyeing of PET / CO blends
6. Development of producing of aroma /Ayurvedic finishing on textile materials

**TOTAL : 45 PERIODS**

**TC3408**

**PROBLEM ANALYSIS AND CASE STUDIES IN  
WET PROCESSING**

**L T P C  
0 0 3 2**

**S.No Experiments**

1. Analyse the Problem & Case Studies in Desizing
2. Analyse the Problem & Case Studies in Scouring
3. Analyse the Problem & Case Studies in Bleaching
4. Analyse the Problem & Case Studies in Mercerizing
5. Analyse the Problem & Case Studies in Dyeing
6. Analyse the Problem & Case Studies in Printing
7. Analyse the Problem & Case Studies in Finishing ( Mechanical and Chemical finishing)

Guide: Critical solution in Dyeing of Cotton Textile materials, R.Shamey & T.Hussg in, Textile Progress Vol 37 July 2005 Page 1-84.

**TOTAL : 45 PERIODS**

**TC3410**

**DISASTER MANAGEMENT**

**L T P C  
3 0 0 3**

**UNIT I INTRODUCTION**

**9**

Introduction – Disaster preparedness – Goals and objectives of ISDR Programme- Risk identification – Risk sharing – Disaster and development: Development plans and disaster management –Alternative to dominant approach – disaster-development linkages -Principle of risk partnership

**UNIT II DISASTER MANAGEMENT AND RISK REDUCTION IN  
PROCESSING**

**9**

Types of disasters and disaster plans: Processing machines and utilities. Sustainable livelihoods and their Protection – Recovery from disaster – Protective finishes for disaster management and their standards: Fire, Chemical and Biochemicals. Textiles health monitoring and Disaster aids.





**UNIT V TESTING OF ECO-PARAMETERS 9**  
 Instrumental Analysis – Chromatographic Methods – Spectroscopy – Inductively Coupled Plasma. Detectors: Flame & photo ionization – electron capture - Thermal conductivity – Flame photometer. Interpretation of test results.

**TOTAL : 45 PERIODS**

**REFERENCE BOOKS**

1. Chavan R.B., Radhakrishnan J., Environmental Issues - Technology Options for Textile Industry, IIT Delhi Publication, 1998
2. Asokan R., Eco-Friendly Textile Wet Processing, NCUTE Publications, New Delhi, 2001
3. Reife A and Freeman H.S., Environmental Chemistry of dyes and pigments, Wiley, 2001, ISBN: 0471589276
4. Eco Textiles '98, Bolton Institute, 1998
5. Eco Textiles, Book of Papers, BTRA, 1996
6. Eco friendly Textiles: Challenges to the Textile Industry, Textiles Committee, Mumbai, 1996.

**TC3003 FIBRE REINFORCED COMPOSITES L T P C**  
**3 0 0 3**

**UNIT I INTRODUCTION 9**  
 Types of composites - fibre particulate and laminar composites - examples. Fibre composites: Constituents - functions of fibre and matrix — Properties of fibres — Critical fibre length — Aligned and random fibre composites — property prediction - rule of mixtures — simple problems.

**UNIT II COMPOSITE MATERIALS 9**  
 Types of high performance fibres - properties - types of matrix materials - Thermoset and Thermo plastics properties — short fibre composites — fibre matrix interface — coupling agents — coupling of interfaces and interfacial reaction in fibre composites — tensile strength of continuous and discontinuous composites -fracture mode in fibre composites.

**UNIT III PREPREGS 9**  
 Introduction to manufacturing techniques - property requirements — Textile preforms - weaving, knitting and braiding.

**UNIT IV COMPOSITE MANUFACTURING TECHNOLOGY 9**  
 Vacuum bagging - compression moulding — injection moulding - pultrusion — thermoforming — filament winding - resin transfer moulding.

**UNIT V PROPERTIES OF COMPOSITES 9**  
 Testing of composites— Fibre volume fraction -Laminar tensile - shear - compression - and flexural properties — interlaminar fracture/failure modes in composites - applications for composites.

**TOTAL : 45 PERIODS**

## REFERENCES

1. Hull.D, An introduction to composite materials - Cambridge University Press - Cambridge, 1998
2. Gupta.L, "Advanced Composite Materials", Himalayam Books, New Delhi, 1998.
3. Mathews F.L and Rawlings R.D "Composite Materials Engineering science" Chapman & Hall, London 1994.
4. Bogdanovich.A and Pastore.C, Mechanics of Textile and Laminated composites, Chapman & Hall, 1997
5. Hearle. J.W.S — "High performance fibres composites and engineering textile structures Journal of the textile institute (special issues) - The Textile Institute 1990.
6. Kostikov, V.L., Fibre Science and Technology (Soviet Advanced Composites Technology Series), Chapman & Hall, 1995.
7. Textile Progress monogram on "Hybrid yarns and textile performing for thermoplastic composites" by R. Alagirusamy, R Fangueiro, V. Ogale and N. Padaki Textile Progress 2006 Vol 38 No. 4 (Wood Head Publishing Limited)
8. Carlsson L.A. and Byron Pipes R. "Experimental characteristics of advanced composite materials" Prentice Hall, Inc 1987.
9. Pipes, R.B., Composite Material Series, Vol. 1 to 3, Elsevier, 2003.
10. Ken Ashbee, Fundamental principles of fibre reinforced composites, Technomic Publishing Co. Inc., Pennsylvania USA, 1989.
11. Leonard Hoilaway, Handbook of Polymer composites for Engineers, Woodhead Publishing Ltd., Cambridge, England, 2004.
12. Geier, M.H., Quality Handbook for Composite Materials, Chapman and Hall, London, U.K., 1994.
13. Gill R.M., Carbon fibres in composite materials, Butterworth Group, 2000.
14. De.S.K. and White J.R. Short fibre polymer composites, Wood head, Manchester, 2001, ISBN:1855732203

**TC3004**

**GARMENT MANUFACTURING TECHNOLOGY**

**L T P C  
3 0 0 3**

### **UNIT I APPAREL INDUSTRY**

**9**

Global Apparel Market - domestic Apparel Market Strength - Weakness - Opportunities - size - nature of the industry. Merchandising: Definition– functions – Role and responsibilities – product development- line planning – line presentation. Need for sourcing- sourcing materials- Overseas sourcing – sourcing strategies. Supply Chain Management. Men, Women, Children – Uniforms selection – Specifications Swimming Sports, Casual, garments for special uses, protective denims

### **UNIT II PATTERN MAKING AND CUTTING**

**9**

Human body measurements – Methods - Pattern making – Grading - Method. Marker planning: requirements – Efficiency – Method – Duplicating – Marker making - Cut order planning. Spreading: Requirements – Methods - Nature of fabric package – Machines. Cutting: requirements – Hand shears- Straight knife - Round knife – Ban knife – Computer control – Die – Laser - Plasma torch – Water jet.

**UNIT III SEWING 9**

Sewing machine fundamentals - Classification – Stitch forming mechanism – Industrial sewing machine working principle. Stitches –properties – Classes. Seams – Properties – Classes. Sewing threads – Types – Characteristics– Thread size – Ticket number.

**UNIT IV APPAREL PRODUCTION SYSTEMS 9**

Basic concepts – Plant layout – Product oriented layout - Process oriented layout – Progressing bundle System (PBS) – Unit Production System (UPS) – Modular Production System (MPS) – Flexible Manufacturing – work flow – Balancing - Buffer - Work study – Method analysis- Work measurement.

**UNIT V PRESSING AND PACKING 9**

Pressing: need – influence – equipments. Packaging: Criteria – folding –specification – standard – equipments.

**ACCESSORIES**

Accessories and Trims: Interlinings –Linings – Adhesives – Shoulder pads – Closures – Zippers –Buttons - Elastic– Hooks. Plackets – Cuff – Pockets-Embroidery – Lace – Labels.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Grace I. Kunz ,Ruth E. Glock Apparel Manufacturing: Sewn Product Analysis, Prentice Hall; 4<sup>th</sup> edition , 2004.
2. Solinger Jacob, “Apparel Manufacturing Analysis”, Columbia Boblin Media, 2000.
3. Gerry Cooklin, “Introduction to Clothing Manufacture” Blackwell Science Ltd., 1995.
4. Peggall. H., “ Introduction to Dress Making”, Marshal Caverdish, London, 2001.

**TC3005 MODERN PRINTING TECHNOLOGY L T P C  
3 0 0 3**

**UNIT I 9**

Offset Printing-Rotogravure-Flexography-Letter press printing-Screen printing-Xerography printing-Ink jet printing-Digital printing-Lithography-Relief printing-Letter press printing-Electronic printing process-Electro photographic printing-Microcapsule printing-Thermal sublimation printing and wax transfer printing

**UNIT II 9**

Fabric preparation, Ink jet ink compositions; Mechanism of ink jet technology; Parameters influencing ink transfer; Colour depth in digital printing; Inks for printing – practical formulations; Precautions before and while printing; Selections of ink jet printers for fabric printing; Fixation / development of prints; After treatments.

**UNIT III 9**

Process control in printing. Process control parameters for printing machinery like rotary, flat bed, roller, loop steamers, agers, polymeriser, RIGHT FIRST TIME printings. Problems & remedies in printing.

**UNIT IV** **9**  
Garment Printing. Various techniques of printing of garments. garment printing machineries and their recent developments.  
Recent developments in printing technology.

**UNIT V** **9**  
Computer aided design systems for textile printing - Recent developments in textile printing machinery including automation. Developments in thickeners, water based binders,

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Miles.L.W.C., Textile Printing, Dyers company Publishing Trust, U.K., 1981
2. Shenai.V.A, "Technology of Printing", Sevak Publishers, Mumbai. 1990
3. Shore.J, Colorants & Auxiliaries, Vol. I & II, S.D.C, 1990
4. Ujje, Digital Printing of Textiles, CRC,ISBN-10: 0849391008, Wood Head Publishing Ltd,UK,2006
5. Tyler, Textile Digital Printing Technologies, Textile Institute Publication UKVol.37 No.4, 2005
6. Chakraborty, J.N, Fundamentals and Practices in colouration of Textiles, Woodhead Publishing India, 2009, ISBN-13:978-81-908001-4-3

**TC3006** **ANALYSIS OF TEXTILE CHEMICALS** **L T P C**  
**3 0 0 3**

**UNIT I** **BASIC CONCEPTS** **9**  
Need for an analytical laboratory – Testing for the quality of raw material for end product quality – Testing for toxic substances. Analysis and its effects in marketability, float and density gradient techniques – Dilute solution viscometer to find out viscosity of a polymer solution – Solubility of a fibre – Birefringence – Melting point – Fibre shrinkage – X-ray diffraction and its application in single fibre analysis.

**UNIT II** **ANALYSIS OF CHEMICALS IN PRETREATMENT** **9**  
Hardness of water – Determination procedure – Iron in water – pH of solution – Importance – Estimation of PH of a solution – Efficiency of desizing agents – Estimation of enzyme activity – Soaponification – Analysis of oil for acid value and soap value, Iodine value – Efficiency of a wetting agent – Sinking time apparatus – Foam stability – Ionic nature of detergent – Efficiency of scouring process – Estimation of copper number – Ethylene Blue absorption – Fluidity, Cuprammonium fluidity – Use of Viscometer – Degree of mercerization – Estimation of Degree of mercerization –Barium activity number – Moisture regain dyeing test – Iodine absorption test – Determination of available chlorine in Sodium Hypochlonte solution —Testing of Bleached cotton fabrics for copper number and Methylene Blue absorption – Tests for aldehyde groups in Fehlings solution.

**UNIT III** **ANALYSIS OF CHEMICALS IN DYEING AND PRINTING** **9**  
Identification of dyes in powder form and from the dyed material. Estimation of the purity of dyes Estimation of the Efficiency of a cationic dye-fixing agent – Evaluation of leveling agent. Estimation of caustic and hydros contents in vat dye liquor – Evaluation of Carriers – Evaluation of dispersing agent for its dispersion stability – Evaluation of oxidising and reducing agents used in printing paste.

**UNIT IV ANALYSIS OF FINISHING CHEMICALS 9**  
 Types of textile softeners – Evaluation of cationic softeners by Methylene Blue method and Bromophenol Blue method – Evaluation of Bon-ionic softeners using ferric cyanide method and Phosphomolybdic acid method and Ammonium cobalt Thiocyanate method – Evaluation of anionic softeners – Evaluation of reactive softeners – Evaluation of Polyethylene emulsions by Estimating total solids and active content – Evaluation of water repellancy imparted by silicon emulsions by testing the treated samples for spray test, cone test, contact angle and capillary raise test – Evaluation different resins by test is the treated samples for total solids, total Formaldehyde and free Formaldehyde – Evaluation of fluorescent brightening agent.

**UNIT V EVALUATION OF COMMON CHEMICALS 9**  
 Estimation of the purity of the following chemicals, such as Hydrochloric acid, Sulfuric acid, Sodium Hydroxide, Sodium carbonate, Sodium Bicarbonate, Sodium Chloride and Sodium Sulphate – Estimation of Hydrogen peroxide content by iodimetry and permanaganometry – Estimation of the oxalic acid – Analysis of Potassium dichromate for total chromium content – Analysis of soap for moisture content unsaponifiable fat free alkyl and the total fatty acid – Estimation of Sodium hydro sulphate. Analysis of Sodium sulphide for its r5educing power. Estimation of chemicals in mixtures viz Sodium carbonate/Sodium hydroxide and Sodium carbonate/Sodium bicarbonate

**TOTAL : 45 PERIODS**

**REFERENCE BOOKS**

1. Peters, A.T., and Freeman,H.S., (Ed), “Analytical chemistry of synthetic colorants”, Blackie, London, 1994, ISBN:0751402087.
2. Reife, A., and Freeman, H.S.,(Ed)., “Environmental chemistry of dyes and pigment”, Wiley., London, 1993, ISBN: 047158276

**TC3007 TECHNICAL TEXTILES L T P C  
3 0 0 3**

**UNIT I HIGH PERFORMANCE FIBRE 9**  
 Manufacture of glass filaments and staple fibre - manufacture of staple fibre yarn-properties and applications of filament and staple fibre yarns. Asbestos Thread: Manufacturing process - properties and applications of asbestos yarn. Ultra High Modulus fibres - Carbon fibres - Aramid and related fibres.

**UNIT II TYRE CORDS AND FABRICS 9**  
 Requirements of tyre cord - suitability of various fibres-Polyester and Nylon tyre cords - manufacture of tyre cords - physical and mechanical property requirements of tyre cord fabrics- fabric design - Specifications - Rubberised textiles.

**UNIT III BELTS 9**  
 Conveyor belts - physical and mechanical properties-construction, manufacture of conveyor belts & power transmission belts. **HOSE:** Construction, applications and properties (physical and mechanical).

**UNIT IV FILTER FABRICS 9**  
 General consideration of filtration of solids from liquids, solid from gases, solids from solids, liquids from liquids, liquids from gases and gases from gases.

**PROTECTIVE CLOTHING:** Fire protection-thermal protection - electro-magnetic protection - water proof fabrics - protection against microorganisms, chemicals and pesticides - protection against aerosols.

#### **UNIT V**

**9**

**MEDICAL TEXTILES:** Surgical Textiles - Suture threads, Cardio Vascular Textiles - Knitted cardiac biological valves. Dialysis Textiles- Hollow fibres as dialysis membrane. Hospital Textiles - Operation and post operation clothing—disposable draperies; sanitary applications

**GEO-TEXTILES:** Geo Textile functions - raw materials - woven, non-woven and knitted geo textiles- Applications of geo-textiles for drainage, separation, soil reinforcement, filtration and erosion control. Textile materials in foot-wear, automotive, agriculture and maritime applications.

**TOTAL : 45 PERIODS**

#### **REFERENCES**

1. Horrocks A. R., Anand S.C., "Handbook of Technical Textiles", Woodhead Publishing, Cambridge, 2000
2. Adanur S., "Handbook of Industrial Textiles", Technomic Publication, Lancaster, 2001
3. Kanna M.C., Hearle, O Hear., Design and manufacture of Textile Composites, Textile progress , Textile Institute, Manchester, April 2004.
4. Scott, Textile for production, Textile progress , Textile Institute, Manchester, Oct. 2005.
5. Shishoo, Textile in spot, Textile progress, Textile Institute, Manchester, Aug. 2005
6. Fung W., Collins & Aikman Textiles in Automotive Engineering ,Woodhead Publishing Ltd., UK, 2000.
7. Kennady, Anand Miraftab, Rajandran, Medical Textile & Biomaterials for Health care, Woodhead publishing Ltd., UK, 2005

**TT2072**

**APPAREL MARKETING AND MERCHANDISING**

**L T P C  
3 0 0 3**

#### **AIM**

To study the various concepts involved in apparel marketing and merchandising.

#### **OBJECTIVE**

- To impart the knowledge of organization, marketing, merchandising, sourcing and documentation aspects of apparel business.

#### **UNIT I**

**9**

Organization of the Apparel Business: Introduction to apparel industry – Organization of the apparel industry – Types of exporters – Business concepts applied to the apparel industry International trade.

#### **UNIT II**

**9**

Marketing: Functional organization of an apparel firm. Responsibilities of a marketing division – Marketing objectives and strategies – Marketing research – Types of markets: Retails and wholesale strategies for merchandise distribution- Retailers' sourcing flows and practices - Marketing plan - Labeling and licensing.

**UNIT III** **9**  
Merchandising: Definition of merchandising – functions of merchandising division – role and responsibilities of a merchandiser – different types of buyers – communications with the buyers – awareness of current market trends – product development line planning – line presentation.

**UNIT IV** **9**  
Sourcing: Need for sourcing- sourcing materials- manufacturing resources planning – principles of MRP – Overseas sourcing – sourcing strategies. Supply chain and demand chain analysis – Materials management for quick response – JIT technology.

**UNIT V** **9**  
Documentation: Order confirmation, various types of export documents, pre-shipment post-shipment documentation, terms of sale, payment, shipment, etc. Export incentives: Duty drawback, DEPB, I /E license-exchange control regulation- foreign exchange regulation acts-export management risk-export finance. WTO / GATT / MFA – functions and objectives, successes and failures

**TOTAL : 45 PERIODS**

**TEXT BOOKS**

1. Elaine Stone, Jean A. Samples, “Fashion Merchandising”, McGraw-Hill Book Company (1985), ISBN: 0–07–061742–2.
2. S.Shivaramu. “Export Marketing” – A Practical Guide to Exporters”, Wheeler Publishing (1996), ISBN: 81-7544-166-6.

**REFERENCES**

1. D. Sinha, “Export Planning and Promotion”, IIM, Calcutta (1989).
2. Tuhin K. Nandi, “Import–Export Finance”, IIM, Calcutta (1989).
3. J.A. Jarnow, M.Guerreiro, B.Judelle, “Inside the Fashion Business”, MacMillan Publishing Company (1987), ISBN: 0-02-360000-4.

**TC3009**                      **CLOTHING SCIENCE AND PRODUCT ENGINEERING**                      **L T P C**  
**3 0 0 3**

**UNIT I** **9**  
**DIMENTIONAL STABILITY:** Hygral expansion - Relaxation shrinkage - Felting shrinkage - methods of measuring dimensional stability to dry cleaning and Dry heat.  
**SERVICEABILITY:** Snagging - Pilling - Abrasion resistance - Tearing strength - Tensile strength - Bursting strength -Corrosive strength - Launderability - Crock resistance - Flammability - Scorching - Fusing - Static electricity - Seam strength and slippage

**UNIT II** **9**  
**COMFORT:** Thermal comfort & conductivity - Air permeability - Water vapour permeability - moisture transport - wetting - wicking - sensorial comfort - water absorption - water repellency – oil repellency – soil resistance.  
**AESTHETICS:** Colour - colour fastness - shade variation – colour measurement

**UNIT III** **9**  
**FABRIC HANDLE:** Bending - Drape - Crease recovery - fabric thickness - Shear - Bias extension - formability - fabric friction - objective evaluation of fabric hand by KES and FAST

**UNIT IV** **9**  
**INTRODUCTION TO DESIGN LOGIC OF TEXTILE PRODUCTS** – Classification of textile products and components.  
**YARN DESIGN** : Material, technology, and specifications - yarn design elements - design based on structure and material properties  
**FABRIC DESIGN** : Material, technology, and specifications - Fabric design elements - design based on structure and material properties

**UNIT V** **9**  
**DESIGN OF APPAREL FABRICS** : Design of women's & Girl's wear - fabric types and materials for European, American and Indian styles - design of men's and boy's wear - fabric type and materials for European, American and Indian styles – Tailorability of fabrics – tailorability of woven and knitted garments – tailorability of leather garments – tailorability of fur garments.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. PradipV, Metha, " An Introduction to Quality Control for the Apparel Industry", ASQC Quality Press, Marcel Dekker Inc" New York, 1992,
2. Wngate loB, and Mohler J.F. "Textile fabrics and their selection", Prentice -HallInc, New Jersey, 1984.
3. Ed Postle R., Kawabata.S and Niwa M., "Objective Evaluation of Fabrics", Textile Machinery Society, Japan, Osaka, 1983
4. Miller "Textiles: Properties and Behaviors in Clothing use", Textile Institute, 1998.
5. Mastudaira T, and Suresh M.N., "Design Logic of Textile Products", Textile Progress, Textile Institute, Manchester, 1997.
6. Slater.K., "Comfort Properties of Textiles", Textile Institute, Manchester, Vol 9, No..4, 1997.
7. Saville B.P, Physical Testing of Textiles, The Textile Institute, Wood head publishing limited, Cambridge,1999.
8. Matisunita, Design Logics, Textile Progress, UK

**TC3010** **NONWOVEN FABRICS AND SPECIALTY FABRICS** **L T P C**  
**3 0 0 3**

**UNIT I** **INTRODUCTION** **9**  
Definition - Classification - Nonwoven manufacturing processes. Raw materials - Binders. Web forming - Lay process. Extrusion nonwovens-spun laying, spun bonding. Dry and wet lay process - Types - Raw materials - Fibre preparation - Process variables - Properties.

**UNIT II BONDING 9**  
Needling: Principle - Needle characteristics - Process variables – Needled-fabric properties. Loop formation processes - Types - Process variables - fabric properties. Hydro-entanglement process - Principle - Process variables - Fabric properties. Drying - Hot air bonding - Heat setting - Thermal calender bonding - Ultrasound bonding. Chemical bonding - Saturation bonding, Print bonding, Foam bonding and Spray bonding. Nonwoven composites

**UNIT III FINISHING AND TESTING 9**  
Mechanical finishing: Shrinking - Compacting and creping, glazing – Calendering – Pressing – Perforating – Slitting – Breaking – Emerising – Raising – Shearing – Singeing – Sewing - Quilting and welding. Chemical finishing washing – Dyeing – Printing – Finishing - Softening - Special effects, coating, laminating and flocking  
Sampling and statistics - Testing conditions - Standards and specifications. Testing of raw materials and finished nonwoven fabrics. Quality control aspects in nonwoven production.

**UNIT IV APPLICATIONS AND PRODUCT DEVELOPMENT 9**  
Nonwovens for hygiene, medicine – safety, cleaning, household products, home textiles - apparels and technical applications. Re-utllization of nonwovens  
Concepts and definitions - Product development for garments, decorative fabrics, home textiles and technical textiles. Costing of nonwoven products. Techno economics

**UNIT V SPECIALTY FABRICS 9**  
Introduction - yarn and fibre types, fabrics. Preparation for narrow fabric production-winding, warping, sizing, looming, Woven narrow fabrics and their constructions - structure of narrow fabrics woven on shuttleless looms. Conventional shuttle looms, unconventional shuttle looms and shuttle less looms for narrow fabrics, Elasticated fabrics, zip - fastener tapes, curtain - heading tapes, ladder tapes, trimmings, braids, labels, nets, laces, flocked fabrics – Coated and laminated textiles. 3D fabrics. Non-pile carpet weaves and their looms. Pile surfaced carpet weaves and their looms. Needle felt floor coverings.

**TOTAL : 45 PERIODS**

#### **REFERENCES**

1. Wilhelm Albrecht etal., " Nonwoven fabrics", WILEY - VCH Verlag GmbH & Company, Germany, 2003.
2. Russel.S, "Handbook of Nonwovens", The Textile Institute Publication, 2007.
3. Irsak.C, " Nonwoven Textiles" Textile Institute", Manchester, 1999
4. Krcma.R., Manual of Non-wovens, Textile Trade Press, Manchester 1993.

**TC3011 ADVANCED WET PROCESSING MACHINERY LT P C  
3 0 0 3**

**UNIT I 9**  
Advances in continuous processing of cotton and wool materials - - Advances in heating systems hank and yarn dyeing machines(cheese and warp) — importance of winding in yarn dyeing — calculation of winding density — detailed maintenance schedule for cheese dyeing machines.  
Use of microprocessors in processing machines.

**UNIT II** **9**  
Advances in Beam dyeing - Advances in soft flow, over flow, jet dyeing machines — Developments in jiggers,—Detail maintenance schedule for beam dyeing, jet dyeing and jiggers.

**UNIT III** **9**  
Detail study and developments in vertical drying ranges - RF dryer, yarn dryer, tubular & open width knitted fabric dryer, Tumble dryer, developments in balloon padding, hydro extractor, rope opener, maintenance schedule for the above machines. Heating systems for hot air stenters, Clip & pin type of stenters; Jig stenters — over feeding system and its importance - Hot flue dryer — float dryer — maintenance schedule for the above machines.

**UNIT IV** **9**  
Developments in preparation of screens for roller, rotary, flat bed screen printing machines. Principle and working of fully automatic flat bed screen printing machine - with programmer line diagram and its advantages - developments in agers - Developments in garment printing machines - various practical problems & possible remedies, Transfer printing machines and dyeing.

**UNIT V** **9**  
Developments in finishing machineries — Calenders, sanforising machine, Back-filling machine, , maintenance schedule for the above machineries. Shop floor problems & possible remedies in finishing department, Sand blasting machine, Peach finishing, Raising, Shearing machines.

**TOTAL : 45 PERIODS**

#### **REFERENCE BOOKS**

1. Datye. K.V. and Vaidya. A.A., Chemical Processing of Synthetic fibres and blends, John Wiley & Sons, New York.1995
2. Chakravarth. R.R. Technology of Bleaching and Dyeing of Textile Fibres, Vol. 1 Part 2, , Mahajan Book Distributors, Ahmedabad. 1982
3. Usenko.V. Processing of Manmade Fibres, MIR Publishers, Moscow. 1995
4. Shirley Institute, Jet dyeing Machines, Shirley Institute Publications, (S 33)., U.K.1981
5. Gokhle S.V. and Dhingra A.K., “Maintenance in Chemical Processing Department of Textile Mills”, , ATIRA, Ahmedabad,1984.
6. Shenai V.A. Technology of Textile Processing, Sevak Publication, 306, Sri Hanuman Industrial Estate, GD Ambedkar Road, Wadala, Bombay.1995
7. Cegarra,J., Puente,P., and Valldeperas,J., “The dyeing of Textile materials”, The Text. Inst., Manchester, 1998, ISBN: 1870812581.
8. Viallier,P., “Heat transfers in Textile finishing industry”, Eurotex, 1991, Blackwells Bookshop, Leeds, U.K.
9. R.S.Bhagwat, “Development in Textile Processing Machines” Colour Publications pvt.Ltd, 2000.

- UNIT I CONCEPTS OF TEXTURISING 9**  
Purpose - Types of texturised yarns - Classification of process - Comparison of texturised and untexturised yarns and fabrics – Mechanics of texturising. Physical and mechanical properties of texturised filament yarn structure and geometry of texturised yarns - Application of texturised yarns - Role of spin finish on texturised yarns. Basic Concepts of Helanca process, false twist, edge crimping, stuffer box gear crimping, knit - deknit, Turbo-duo-twist and air jet texturising, - (Principles only).
- UNIT II DRAW TEXTURISING & FALSE TWIST TEXTURISING 9**  
Advantages - Simultaneous and sequence draw texturising - Working principles and machines,  
Principle - Single heater and double heater - False twist texturising machines. Twisting elements - Factors influencing Twist - Properties of Textured yarn - Effect of feed material and process variables.
- UNIT III FRICTION TEXTURISING AND AIR JET TEXTURISING 9**  
Principles - Beltex Unit, Ring tex Unit, - Heating elements mechanism of heating - Zone length and speed. Texturised yarn defects. Air Jet Texturising- Principle - Air jet nozzle types - Process variables - Yarn properties
- UNIT IV TEXTURISING OF MAN MADE FIBRES 9**  
Principal methods of - Sheath core technique - thermo plasticization - Crystallization and decrystallisation. Texturising of Polyester, Nylon, Polypropylene, Acrylic, Viscose and their blends. Spin finish requirements for filaments meant for texturising. Dyeing considerations-Texturised Nylon and polyester yarns high temperature dyeing and jet dyeing - Finishing of textured yarns and fabrics by heat setting.
- UNIT V QUALITY CONTROL AND MACHINE DESIGN CONCEPTS 9**  
Measurement of shrinkage force - Crimp contraction and dye uniformity - Texturamat - M.Dynafil tester. Machine elements and layout - Yarn path.- Take- up system and automation.

**TOTAL : 45 PERIODS****REFERENCES**

1. 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
2. Gupta.V.B "Winter School on Man-made fibres – production, processing, structure, properties and applications Vol. 1 & 2", 2000
3. Hes.L. Ursinyp. "Yarn Texturing Technology", Eurotex, U.K., 2001.
4. Wilson D.K. Kollu T. "Production of Textured yarns by methods other than False Twist technique", TP Vol. 16, No.3, Textile Institute 1998.
5. Demir.A "Synthetic Yarn Production", Prentice –Hall Inc, New Delhi. 2004.
6. Behery H.M. and Demir A. Synthetic filament yarn texturing technology, Prentice Hall, 2001.
7. Hearle J.W.S., Texturizing Technology, Woodhead Publishing, UK, 1998.
8. Gandhi R S. "Textured yarns', MANTRA, 1998

**UNIT I SOURCES OF ENERGY 9**

Limitations of Natural resources. Unexploited energy sources and problems in their exploitation. Concept of energy management - need for energy conservation- global energy scenario with specific reference to India -Demand side Management (DSM).

**UNIT II ENERGY CONSUMPTION 9**

Spinning – Weaving – Knitting - Processing – Garmenting. Auxiliary machineries – Component wise consumption - Specific energy consumption (UKG) - Cost of energy Vs sales value of textile product. Conservation of energy.

**UNIT III ENERGY AUDIT 9**

Concept - Types of audit - Instrumentation - methodology - analysis. Electrical and Thermal audit

**UNIT IV ENERGY CONSERVATION 9**

Techniques of energy saving: Energy efficient equipments for various processing machines and ancillaries – Preparatory – Spinning - Post Spinning - Weaving Wet Processing - Humidification/Air conditioning – Lighting – Compressors - Boilers – Generators. Different types of fuels. Economics of energy conservation techniques.

**UNIT V NON-CONVENTIONAL ENERGY SOURCES 9**

Solar energy: Different type of collectors – Photovoltaic cell - Wind energy - Bio energy - co- generation.

Environmental impact on energy.

**ENERGY INSTRUMENTATION**

Analog - Digital - Computerized instruments Measurement techniques. Maintenance of instruments.

**TOTAL : 45 PERIODS**

**REFERENCES**

1. Energy Conservation in Textile Industry, SITRA, 1985
2. Vallier,P," Energy uses in the Textile Finishing Industry", Eurotex, 1990
3. Palaniappan C et ai, "Renewable Energy Applications to Industries", Narose Publishing House, 1998.
4. Proceedings of International Seminar cum Exhibition ASIA Energy Vision 2020" - sustainable energy supply, November 15-17, 1996.
5. Proceedings of the Seminar, "Strategies for Sustainability of Energy Efficient and Environmental Friendly Technologies in Small and Medium Scale Sector", PSG College of Technology, November 24, 2000.
6. Pradeep Chaturvedi & Shaltni Joshi," Strategy for Energy Conservation in India", Concept Publishing Co. , 1995. Heat economy in Textile mills", ATIRA, Ahmedabad, 1996.
7. Energy conservation in Textile Industry", SITRA, Coimbatore,1997.
8. Vallier,P., "Energy uses in the textile finishing industry", Eurotex, 1999.
9. Sang Yang Kim, Grady, P.L. and Hersh, S.P., "Energy consumption and conservation in the fibre producing and textile industry", Textile Progress , Vol. 13, No.3, Textile Inst., Manchester, 1983

**UNIT I HUMAN VALUES 9**  
Morals, Values and Ethics – Integrity – Work Ethic – Service Learning – Civic Virtue – Respect for Others – Living Peacefully – caring – Sharing – Honesty – Courage – Valuing Time – Co-operation – Commitment – Empathy – Self-Confidence – Character – Spirituality

**UNIT II ENGINEERING ETHICS 9**  
Senses of 'Engineering Ethics' - variety of moral issued - types of inquiry - moral dilemmas - moral autonomy - Kohlberg's theory - Gilligan's theory - consensus and controversy – Models of Professional Roles - theories about right action - Self-interest - customs and religion - uses of ethical theories.

**UNIT III ENGINEERING AS SOCIAL EXPERIMENTATION 9**  
Engineering as experimentation - engineers as responsible experimenters - codes of ethics - a balanced outlook on law - the challenger case study.

**UNIT IV SAFETY, RESPONSIBILITIES AND RIGHTS 9**  
Safety and risk - assessment of safety and risk - risk benefit analysis and reducing risk - the Three Mile Island and Chernobyl case studies.  
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 - Environmental ethics - computer ethics - weapons development - engineers as managers-consulting engineers-engineers as expert witnesses and advisors -moral leadership-sample code of Ethics like ASME, ASCE, IEEE, Institution of Engineers (India), Indian Institute of Materials Management, Institution of electronics and telecommunication engineers(IETE),India, etc.

**TOTAL : 45 PERIODS**

#### REFERENCES

1. Mike Martin and Roland Schinzinger, "Ethics in Engineering", McGraw-Hill, New York, 1996.
2. Govindarajan M, Natarajan S, and Senthil Kumar V. S, "Engineering Ethics", Prentice Hall of India, New Delhi, 2004.
3. Charles D. Fleddermann, "Engineering Ethics", Pearson Education / Prentice Hall, New Jersey, 2004 (Indian Reprint now available)
4. Charles E Harris, Michael S. Protchard and Michael J Rabins, "Engineering Ethics – Concepts and Cases", Wadsworth Thompson Leatning, United States, 2000 (Indian Reprint now available)
5. John R Boatright, "Ethics and the Conduct of Business", Pearson Education, New Delhi, 2003.

**UNIT I FIBER, YARN AND P PRODUCTION 9**

Online monitoring of machine and process performance in man-made fiber production, cotton blending, opening and cleaning. – online nep monitoring in cards. Working of open loop and closed loop autolevellers in modern drawframe. Principle of operation of RINGDATA & RING-i systems. CYROS and OASYS systems for online yarn simulation. Computerised yarn clearing on modern winding machines.

**UNIT II FABRIC PRODUCTION AND PROCESSING 9**

Basics of online monitoring of machine and process performance at different stages of fabric production—Online process control systems in sizing process. – Online monitoring of loom working. – Loom –i and Mill-i systems. Uster Fabricscan for automatic fabric inspection and quality control. Textile CAD: Plain and stripe effect, automatic peg plan and draft generation; Weave construction library, Warp and Weft design, Simulation of colour and weave effect. Automation in Textile Chemical Processing Industry – Temperature control, Pressure control, Bath level control, Online control systems in continuous processing including stenter, Online color matching system, Computer color matching, Print design CAD: Touch up and production of mask films; automatic repeats and half drop generation, colour separation.

**UNIT III APPAREL CAD/ CAM 9**

Introduction to Pattern Making and Grading Software – Principles of pattern making, Garment balance, Size charts, Pattern grading, Computerised made-to-measure systems, Main technological advances in pattern making, Material utilizations. Computer Controlled Machines: Fabric Laying, Cutting, Sorting, Labeling Machines, Embroidery Machine and its Software's. Computer Aided Fashion Designing Software's. Computer Aided Colour Matching. Computer Controlled Overhead Transport. Computer Aided Warehouse Storage Systems – application of RFID.

**UNIT IV ADMINISTRATION AND BUSINESS TOOLS 9**

Electronic spreadsheet and its application; Fundamentals of Ecommerce: foundation, types, and application of e-commerce. Electronic Tools used in Textile Industry: Electronic Data Interchange, Electronic Payments and Security, Electronic Fund Transfer. Internets and Extranets in Business, Application of Intranets, the role of Extranets in the business concepts of Business Information Systems.

**UNIT V PRODUCTION AND MANAGEMENT TOOLS 9**

Concept of ERP& MIS and its application. Mass Customizations Methodology and its concepts in Apparel Industry, Supply Chain Management and its concepts, Computer Aided Production Planning and Control, Computer Aided Unit Production Systems and its Auxiliaries. Introduction to ANN and Image processing with reference to textile industry.

**TOTAL : 45 PERIODS****REFERENCES**

1. Jayaraman S., "Computer Science and Textile Science, Textile Progress, Vol.26., No.3, Textile Institute, Manchester, U.K., 2004.,
2. Barella A., "Online quality control in Spinning and Weaving", Textile Progress, Vol 17, No.1, Textile Institute, Manchester, U.K.,1998

3. Alison Beazley & Terry Bond, "Computer Aided Pattern Design and Product Development", Blackwell Science Publisher, USA, 2004.
4. Williams, Sawyer, Hutchinson, "Using Information Technology: A Practical Introduction to Computers and Communications", Irwin-McGraw Hill Publishing Company Limited, New Delhi, 1999.
5. Pradip K.Sinha and Preethi Sinha, "Computer Fundamentals Concepts, Systems and Applications", First Indian Edition, BPB Publications, 2003.
6. James A. O'Brien, "Management Information System" 8<sup>th</sup> edition, Tata McGraw- Hill Publishing Company Limited, New Delhi, 2006.
7. Winfred Aldrich, "CAD in Clothing and Textiles", Blackwell Science Publisher, USA, 1994.
8. Patric Taylor, "Computer in the Fashion Technology", Om Book International, New Delhi, 1997.
9. Stephen Gray, "CAD / CAM in Clothing and Textiles", Gower Publishing Limited, 1998.

**TC3016**

**KNITTING TECHNOLOGY**

**L T P C**  
**3 0 0 3**

**UNIT I**

**9**

Comparison between Knitting and weaving.- Classification of weft knitting. Mechanical elements of weft knitting-Needles, Sinkers and jacks, cams, cylinder, feeder and take up. Yarn path in weft knitting machine. Yarn requirements for weft knitting.

**UNIT II**

**9**

Fundamentals definitions of weft knitting –Needle loop, Sinker loop, technical face, technical back, open loop, closed loop, course wale, Stitch density, loop length, etc, Fundamental formation of knit tuck and float stitches. Basic knitted structures i.e. plain, rib, interlock and purl, knitting cycle of operation and needle control.

**UNIT III**

**9**

Effect of loop length and properties of fabrics. Factors affecting the loop length, Faults in weft knitting, causes and remedies, Production calculation. Elements of Flat knitting machines – Different types of machines.

**UNIT IV**

**9**

Fundamental classification of Warp knitting. Definitions – open loop, closed loop, under lap, Swinging, Shogging, etc, - Classification of warp knitting - Tricot, Raschel & Simpler machines – 2 bar,3 bar and 4 bar machines. Simple warp knitted structures.

**UNIT V**

**9**

Beam preparation for Warp knitting, yarn requirements – Positive and Negative let off mechanisms - Production calculations in Warp knitting. Recent developments in Warp & weft knitting.

**TOTAL : 45 PERIODS**

## REFERENCES

1. Henry Johnson, "Introduction to Knitting Technology" Abhishek Publications, Chandigarh, 2006
2. Samuel Raz: Flat Knitting Technology, C.F.Rees GmbH, Druck-Repro-Verlag, Heidenheim, Germany, 1993
3. Chandrasekhar Iyer, Bernd Mammal and Wolfgang Schach., "Circular Knitting", Meisenbach GmbH, Bamberg, 1995
4. Ajgaonkar D.B., "Knitting Technology", Universal Publication Corporation, Mumbai, 1998
5. Spencer D.J., "Knitting Technology", Textile Institute, Manchester, 2006.
6. Anbumani N., Knitting - Fundamental, Machine, Structure, development, New Age International Pvt. Ltd., 2007

**TC3017**

**HOME TEXTILES**

**L T P C**  
**3 0 0 3**

### **UNIT I HOME FURNISHING**

**9**

Development in Textile Furnishing – Type of Furnishing Materials – Woven and Non-woven Selection of facilities – Colours – Design – Textile wall hanging – Cushion covers – Kitchen Textile – Apron-Dish cloth – Bread Bag – Pot Holders – Table mats – Upholstery application : Fixed upholstery – Non-stretch loose covers – Stretch covers.

### **UNIT II FLOOR COVERINGS**

**9**

Recent development – Hand floor covering, Resilient Floor Soft floor Rugs, - Cushion and pads. Care – Tufted - Needle felt backing woven.. Woven carpet manufacture – wilton weaving, Shedding mechanism - Aximinister. Tufted carpet Manufacture – Broadloom machinery, Hand tufting, Thermo-bonded products Unconventional methods for making carpets – Bonding knitted carpet, Stitch bonding flocking.

### **UNIT III CURTAINS AND DRAPERIES**

**9**

Advances in Home decoration – Draperies – Choice of Fabrics – Curtains – Developments in Finishing of Draperies – Developments in tucks and pleats - uses of Drapery Rods, Hooks, Tape Rings and pins. Table Textiles :- Table cloths – colour – Woven Printed, Jacquard , embroidered types, non-woven types. Table mats – Colour – Woven- Printed jacquard, Embroidered.

### **UNIT IV BED LINERS**

**9**

Advances in the production –Different types: – Sheets – Blankets – Blanket Covers – Comforts – Comfort Covers – Bed Spreads – Mattress and Mattress Covers – Pads – Pillows. General: Hand / machine embroidered scarves - Stoles – Shawls - Madeups used in hospitals, Textiles care labeling Design aids.

### **UNIT V TOWELS**

**9**

Types – Bath robes – Beach Towel – Kitchen Terry – Napkins. Construction : weave – Pile height - Pattern Dyeing and Finishing .

**Window Textile** Sun Filters – Reflective textile .

**Velour** Type of Velvet – Jacquard – Dobby – Plain Pointed Manufacturing Methods – Construction.

**TOTAL : 45 PERIODS**

## REFERENCES

1. Wingate I.B., & Mohler J.E., Textile Fabrics & Their Selection, Prentice Hall Inc, New York, 1984.
2. Alexander N.G., Designing Interior Environment, Mass Court Brace Covanorich, Newyork, 1972.
3. Donserkery K.G., Interior Decoration in India, D.B. Taraporval Sons and Co. Pvt Ltd., 1973
4. Wingate I.B., & Mohler J.E., Textile Fabrics & Their Selection, Prentice Hall Inc, New York, 1984.
5. Alexander N.G., Designing Interior Environment, Mass Court Brace Covanorich, Newyork, 1972.
6. Donserkery K.G., Interior Decoration in India, D.B. Taraporval Sons and Co. Pvt Ltd., 1973
7. Elsasser, Virginia Hencken, "Know Your Home Furnishings", Fairchild Books & Visuals, September, 2003.
8. Cargill, Katrin, "Home Furnishing Workbook: Featuring 32 Step-by-step Textile Furnishing Projects", Rayland Peters and Small, USA, 2001.
9. Whitemore Maureen, "The Home Furnishings Workbook", Randall International November, 1999.