TEXTILE TECHNOLOGY

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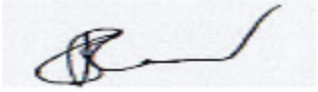
M.Tech. Textile Technology



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Department of Textile Technology

Vision

To bring forth world class human resources to Textile Industry by offering *curriculum of International standard* and by undertaking *research in frontier areas* of Textile Technology

Mission

The Department is committed to *set standards of excellence* in its academic programmes by enabling its students to achieve a blending of knowledge acquisition and applications of such knowledge in real life situations. It is also aimed to equip them to adapt themselves to changing global and local needs by *team work, leadership, upholding professional ethics* and to contribute their might in *transforming India into a world leader* in technological advancement and prosperity.

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Kumaraguru College of Technology
Coimbatore – 641 049
Regulation 2015

CBCS – PG Curriculum

Name of the PG Programme: M.Tech. – Textile Technology

Foundation Courses(FC)

S. No.	Course Code	Course Title	Periods/Wk & Credits				Preferred Semester
			L	T	P	C	
1.	P15TX*T*101	Statistical Application in Textile Engineering	3	2	0	4	I
2.	P15TX*T*301	Research Methodology	3	0	0	3	III

Professional Core(PC)

S. No.	Course Code	Course Title	Periods /Wk& Credit				Preferred Semester
			L	T	P	C	
Specilisation 1:							
1.	P15TX*T*102	Fibre Science	3	0	0	3	I
2.	P15TX*T*103	Theory of Yarn Formation	3	0	0	3	I

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3.	P15TX*T*104	Structural Mechanics of Fabrics	3	0	0	3	I
4.	P15TX*T*105	Advances in Chemical Processing	3	0	0	3	I
5.	P15TX*P*101	Advanced Textile Testing Lab	3	0	0	3	I
6.	P15TX*T*201	Yarn Quality Analysis	3	0	0	3	II
7.	P15TX*T*202	Fabric Quality Analysis	3	0	0	3	II
8.	P15TX*T*203	Technical Textiles	3	0	0	3	II
9.	P15TX*T*204	Clothing Comfort	3	0	0	3	II

Professional Electives(PE)

S. No.	Course Code	Course Title	Periods /Wk& Credits				Preferred Semester
			L	T	P	C	
1	P15TX*T*E01	Textile Polymer Rheology	3	0	0	3	I
2	P15TX*T*E02	Characterization of Textile Polymers	3	0	0	3	II
3	P15TX*T*E03	Theory of Coloration	3	0	0	3	II
4	P15TX*T*E04	Enzyme Technology for Textile Processing	3	0	0	3	III
5	P15TX*T*E05	Advances in Textile Finishing	3	0	0	3	III
6	P15TX*T*E06	Textile Effluents Management	3	0	0	3	III

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7	P15TX*T*E07	Textile Composites	3	0	0	3	I
8	P15TX*T*E08	Design and Analysis of Textile Experiments	3	0	0	3	II
9	P15TX*T*E09	Advancements in Medical Textiles	3	0	0	3	II
10	P15TX*T*E10	Protective Clothing for Hazardous Environment	3	0	0	3	III
11	P15TX*T*E11	Textiles in Civil Construction and Transportation	3	0	0	3	III
12	P15TX*T*E12	Control systems and Automation in Textile Engineering	3	0	0	3	III
13	P15TX*T*E13	Apparel Production Management	3	0	0	3	I
14	P15TX*T*E14	Apparel Quality Control and Standards	3	0	0	3	II
15	P15TX*T*E15	Textile costing & Optimization	3	0	0	3	II
16	P15TX*T*E16	Management of Research and Development	3	0	0	3	III
17	P15TX*T*E17	Export Documentation and Global Marketing	3	0	0	3	III
18	P15TX*T*E18	Management of Textile Production	3	0	0	3	III

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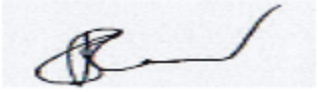
Employability Enhancement Courses(EEC)							
S. No.	**Course Code**	**Course Title**	**Periods /Wk& Credits**				**Preferred Semester**
			L	**T**	**P**	**C**	
1.	P15TX*P*201	Analytical Study	0	0	4	2	2
2.	P15TX*P*301	Project Work Phase I	0	0	12	6	3
3.	P15TX*P*401	Project Work Phase II	0	0	24	12	4

SEMESTER – I



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	Course Code	Course Title	Category	Contact Hrs	L	T	P	C
Theory								
1.	P15TX*T*101	Statistical Application in Textile Engineering	FC	60	3	2	0	4
2.	P15TX*T*102	Fibre Science	PC	45	3	0	0	3
3.	P15TX*T*103	Theory of Yarn Formation	PC	45	3	0	0	3
4.	P15TX*T*104	Structural Mechanics of Fabrics	PC	45	3	0	0	3
5.	P15TX*T*105	Advances in Chemical Processing	PC	45	3	0	0	3
6.	E 1	Elective 1	PE	45	3	0	0	3
Practicals								
7.	P15TX*P*101	Advanced Textile Testing Lab	PC	30	0	0	2	1
Total credits 20								

SEMESTER – II

	Course Code	Course Title	Category	Contact Hrs	L	T	P	C
Theory								
1.	P15TX*T*201	Yarn Quality Analysis	PC	45	3	0	0	3
2.	P15TX*T*202	Fabric Quality Analysis	PC	45	3	0	0	3
3.	P15TX*T*203	Technical Textiles	PC	45	3	0	0	3
4.	P15TX*T*204	Clothing Comfort	PC	45	3	0	0	3

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5.	E 2	Elective 2	PE	45	3	0	0	3
6.	E 3	Elective 3	PE	45	3	0	0	3
Practicals								
7.	P15TX*P*201	Analytical Study	EEC	45	0	0	4	2
Total credits 20								
SEMESTER – III								
	Course Code	**Course Title**	**Category**	**Contact Hrs**	**L**	**T**	**P**	**C**
Theory								
1.	P15TX*T*301	Research Methodology	FC	45	3	0	0	3
2.	E 4	Elective 4	PE	45	3	0	0	3
3.	E 5	Elective 5	PE	45	3	0	0	3
4.	E 6	Self Study	PE	45	0	0	0	3
Practicals								
5.	P15TX*P*301	Project Work Phase I	EEC		0	0	12	6
Total credits 18								
SEMESTER – IV								
	Course Code	**Course Title**	**Category**	**Contact Hrs**	**L**	**T**	**P**	**C**
Practicals								
1.	P15TX*P*401	Project Work Phase II	EEC		0	0	24	12
Total credits 12								

Electives								
	Course Code	**Course Title**	**Category**	**Contact Hrs**	**L**	**T**	**P**	**C**
Specilisation 1 ** Fibre Science								
1.	P15TX*T*E01	Textile Polymer Rheology	PE	45	3	0	0	3
2.	P15TX*T*E02	Characterization of Textile Polymers	PE	45	3	0	0	3
3.	P15TX*T*E03	Theory of Coloration	PE	45	3	0	0	3
4.	P15TX*T*E04	Enzyme Technology for Textile Processing	PE	45	3	0	0	3
5.	P15TX*T*E05	Advances in Textile Finishing	PE	45	3	0	0	3
6.	P15TX*T*E06	Textile Effluents Management	PE	45	0	0	0	3
Specilisation 2 **Advanced Textile Engineering								
1.	P15TX*T*E07	Textile Composites	PE	45	3	0	0	3
2.	P15TX*T*E08	Design and Analysis of Textile Experiments	PE	45	3	0	0	3
3.	P15TX*T*E09	Advancements in Medical Textiles	PE	45	3	0	0	3
4.	P15TX*T*E10	Protective Clothing for Hazardous Environment	PE	45	3	0	0	3
5.	P15TX*T*E11	Textiles in Civil Construction and Transportation	PE	45	3	0	0	3
6.	P15TX*T*E12	Control systems and Automation in Textile Engineering	PE	45	0	0	0	3
Specialization 3 **Advanced Textile Engineering								

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1.	P15TX*T*E13	Apparel Production Management	PE	45	3	0	0	3
2.	P15TX*T*E14	Apparel Quality Control and Standards	PE	45	3	0	0	3
3.	P15TX*T*E15	Textile costing & Optimization	PE	45	3	0	0	3
4.	P15TX*T*E16	Management of Research and Development	PE	45	3	0	0	3
5.	P15TX*T*E17	Export Documentation and Global Marketing	PE	45	3	0	0	3
6.	P15TX*T*E18	Management of Textile Production	PE	45	0	0	0	3
Total credits 70								

*** All electives should be only in category PE ,**

**** Grouping of electives according to specialization is optional**

ONE CREDIT COURSES		
Sl.No.	**Course Title**	**Industry that will offer the course**
1.	P15TXIN01 – Lean Manufacturing For Apparel Industry	Garment Industry
2.	P15TXIN02 – Specialty Fabric Structures	Weaving & Garment Industry
3.	P15TXIN03 – Denim Fabrics And Garments	Weaving & Garment Industry
4.	P15TXIN04 – Automotive Textiles	Technical Textile Industry

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5.	P15TXIN05 – Erection and Commissioning of Textile Machines	Spinning Industry
6.	P15TXIN06 – Export Documentation	All Textile Industry
7.	P15TXIN07 – Quality Improvement Program In Home Textile Industry	Home Textile Industry

SEMESTER I

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3	2	0	4

P15TX*T*101/ STATISTICAL APPLICATION IN TEXTILE ENGINEERING

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Apply the distribution functions in Textile related problems

CO2: Analyze the significance of sampling and its techniques

CO3: Analyze the different models of variance

CO4: Design and interpret the process control charts

CO5: Choose and evaluate the experiments by factorial designs

Pre-requisites:

1. Probability and Applied Statistics
2. Textile Quality evaluation

PROBABILITY DISTRIBUTION AND ESTIMATIONS 12 Hrs

Applications of Binomial, Poisson, normal, student's, t, chi-square, f and Weibull distributions in textile engineering; point estimates and interval estimations of the parameters of the distribution functions

12 Hrs

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HYPOTHESIS TESTING

Sampling distribution; significance tests applicable to textile quality parameters – normal test, t-test, chi-square test and F-test; selection of sample size and significance levels with relevance to textile applications; acceptance sampling

12 Hrs

ANALYSIS OF VARIANCE AND NON-PARAMETRIC TESTS

Analysis of variance for different models; non-parametric tests.

PROCESS CONTROL AND CAPABILITY ANALYSIS 12 Hrs

Control charts for variables and attributes - basis, development, interpretation, sensitizing rules, average run length; capability analysis

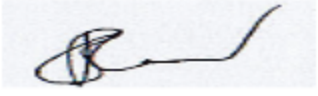
DESIGN AND ANALYSIS OF EXPERIMENTS 12 Hrs

Limitations of experimental design; Latin square design,Randomized block design-2k full-factorial designs; development of regression models, calculation of regression coefficients; adequacy test for regression equations; process optimizations, multivariate analysis

Theory : 45 Hrs Tutorial : 15 Hrs Total: 60Hrs

References

1. Douglas C. Montgomery, “Design and analysis of experiments”, John Wiley & Sons, Inc, Singapore, ISBN 9971 51 329 3, 2000.
2. Ronald D. Moen, Thomas W. Nolan, Lloyd P. Provost, “Quality improvement through planned experimentation’, McGraw-Hill, ISBN 0-07-913781-4, 1998.
3. Hayavadana. J, “Statistics for textile and apparel management” wood head publishing India (P) Ltd, 2012, ISBN – 8789380308-04-3
4. J.R.Nagla, “Statistics for textile engineers” woodhead publishing India (P) Ltd, 2013, ISBN: 1782420673
5. Meloun, Miliky, “Statistical data analysis a practical guide” wood head publishing,, 2011, ISBN: 0857091093



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6. Montgomery D.C., “Introduction to Statistical Quality Control”, John Wiley and Sons, Inc., Singapore, ISBN: 997151351X, 2002.
7. Leaf G.A.V., “Practical Statistics for the Textile Industry, Part I and II”, The Textile Institute, Manchester, ISBN: 0900739517, 1984

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P15TX*T*102/ FIBRE SCIENCE

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Identify the different fibre structures using SEM, TEM, Nuclear Magnetic Resonance, The scanning Tunneling microscope (STM), The Atomic Force Microscope (AFM). X-ray diffraction, IR spectroscope.

CO2: Recognize the instrument to identify the various properties of fibre

CO3: Dramatize the various changes of properties in various fibre

CO4: Outline the fibre properties and its measurements

CO5: Summarize the fibre properties for further process

Pre-requisites:

1. Textile Fibres
2. Physical Properties of Textile Fibres

FIBRE STRUCTURE **9 Hrs**

Fibre Structure: Parameters of fine and morphological structures. Structural models: Fringed fibriller, fringed micelle, order and orientation. Structure Study Techniques: Optical and electron microscope – SEM, TEM, Nuclear Magnetic Resonance, The scanning Tunneling microscope (STM), The Atomic Force Microscope (AFM). X-ray diffraction, IR spectroscope.

MOISTURE PROPERTIES **9 Hrs**

Theoretical explanation of moisture and related properties - Conditioning -


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Mechanism of conditioning, factors influencing rate of conditioning - Effect of conditioning on fibre properties. Swelling - Types and measurement– Surface adsorption - Heats of sorption - Differential and integral heat of sorption - measurement of sorption - Diffusion of moisture, Interaction of moisture and heat changes.

MECHANICAL PROPERTIES 9 Hrs

Tensile properties of fibres – Effects of variability – Elastic recovery –Time effects – fibre stress and deformation other than tensile – Bending and bending fatigue – shear properties – loop strength and knot strength – Torsional properties, Model theory of visco elasticity, rubber elasticity. Theories of mechanical properties – variety of approaches – structural effect in various fibres – Theories of time dependence, Thermo dynamic effects

ELECTRICAL & THERMAL PROPERTIES 9 Hrs

Dielectric properties – Measurement – effect. Electrical resistance of fibres, Static electricity - measurements of static electricity – Problems and elimination. Thermal conductivity – specific heat - Various thermal parameters of fibres – structural changes. Thermal transitions – Secondary - Second order and first order transitions, multiple transitions. Nature and mechanism of Heat setting of fibres – physics of heat setting – Heat setting and structural parameters – Mechanism of heat setting – Thermodynamic Argument of heat setting – multiple sequence – structural model, Thermo gravimetric analysis and interpretation of results.

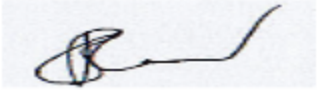
OPTICAL & FRICTIONAL PROPERTIES 9 Hrs

Refractive index of fibres - Birefringence and optical orientation factor. Absorption and Dichroism. Comparison of optical orientation factor with X-ray orientation and FTIR orientation factors - Reflection of light, Luster index, factors influencing luster. Fibre friction – measurement and empirical results of fibre – directional friction effects of wool.

Theory : 45 Hrs Tutorial : 00 Hrs Total: 45 Hrs

References:

1. Morton W E and Hearle J W S, “Physical properties of Textile fibres”, Textile Institute, UK, 1993.
2. Mukhopadhyay S K, “Advances in Fibre Science”, Textile Institute, UK, 2000.
3. Carty P,“Fibre Properties”, Pentaxion Publishers, 1996, ISBN: 9781874430889
4. Gupta V.B., Kothari V.K. Textile Fibres: Developments and Innovations. Vol. 2, Progress in Textiles: Science & Technology. IAFL Publications, 2000..
5. Warner S, “Fiber Science”, Prentice Hall, 1995, ISBN: 9780024245410.
6. Gupta V P and Kothari V K, “Manufactured Fibre Technology”, Chapman & Hall Publishers, 1997.
7. Mishra S P, “Textbook of Fibre Science and Technology”, New age publications, 2000



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P15TX*T*103/ THEORY OF YARN FORMATION

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Analyze material flow control, mixing/blending, evenness, strength, hairiness, packing of fibres in yarns, hairiness and migration behaviour

CO2: Evaluate the various yarn spinning systems for the packing of fibres in the yarns produced

CO3: Study the various spinning machinery from the view point of insertion of twist *starting* from draw frame and inclusive of all new spinning systems

CO4: Explain the various processes in spinning (opening, cleaning, drafting, twisting and winding).

CO5: Narrate various drafting system & their functions.

Pre-requisites:

1. Yarn Manufacturing Technology I
2. Yarn Manufacturing Technology II
3. Theory of Drafting
4. Theory of Twisting

FIBRE DISPERSION AND CLEANING 9 Hrs

Mechanism of ginning of cotton, factors affecting ginning; the necessity fibre-individualization; fibre opening and cleaning in blow-room machinery; forces acting on the fibre during carding operation; the mechanism of fibre - dispersion, fibre transfer, short fibre removal and trash removal; theory of hook formation; mechanism of removal of short fibre, neps and trash in comber.

ATTENUATION AND FIBRE STRAIGHTENING 9 Hrs

Principle of roller drafting and its application in yarn production; ideal drafting; factors affecting drafting force, drafting irregularities and their causes and remedies; amount of draft and draft distribution on strand irregularity; the

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function of aprons in roller drafting; limitation of apron-drafting and the scope for improvement; mechanism of wire- point drafting and its application in yarn production; merits and demerits of wire-point drafting; comparison of wire-point drafting with roller drafting

TWISTING **9 Hrs**

mechanism of twisting principles in ring spinning-balloon and spinning triangle formation and their effects on yarn quality and productivity; separation of twisting and winding actions of yarn; modified twisting principles - open end twisting, false twisting, air-jet twisting, air-vortex twisting, up-twisting, two-for-one twisting, hollow-spindle twisting; merits and demerits of modern twisting system. Adhesive process: Bobtex and Twistless spinning

YARN GEOMETRY **9 Hrs**

Basic Yarn Geometry - Packing of fibres in yarn; Fibre arrangement in twisted yarn; Mechanism of fibre migration; effect of various parameters on migration.relationship of ring, rotor, air-jet and friction spun yarns.

FIBRE BLENDING AND LEVELLING **9 Hrs**

Importance of achieving homogeneous blending in fibre-mix; types of mixing during spinning preparatory process; lateral and longitudinal fibre blending; analysis of fibre blend index values; process parameters of spinning machinery for processing blended material; different methods of levelling adopted during spinning processes.

Theory : 45 HrsTutorial : 00 HrsTotal: 45 Hrs

References:

1. Morton W E and Hearle J W S, “Physical properties of Textile fibres”, Textile Institute, UK, 1993.
2. Mukhopadhyay S K, “Advances in Fibre Science”, Textile Institute, UK, 2000.
3. Carty P,“Fibre Properties”, Pentaxion Publishers, 1996, ISBN: 9781874430889
4. Gupta V.B., Kothari V.K. Textile Fibres: Developments and

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5. Warner S, “Fiber Science”, Prentice Hall, 1995, ISBN: 9780024245410.
6. Gupta V P and Kothari V K, “Manufactured Fibre Technology”, Chapman & Hall Publishers, 1997.
7. Mishra S P, “Textbook of Fibre Science and Technology”, New age publications, 2000

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P15TX*T*104/ STRUCTURAL MECHANICS OF FABRICS

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Analyze the geometry and construction of various fabrics and relate the geometry with fabric properties

CO2: Formulate equations for prediction of tensile properties of various fabrics and explain the reasons for such behavior.

CO3: Explain the relationship between shear and bending deformation and fabric drape and mechanical properties

CO4: Apply the knowledge of Dimensional properties and Relaxation – shrinkage in designing knitted garments.

CO5: Describe the theories on Fabric Bending, bending stiffness, and bending hysteresis

Pre-requisites:

1.Engineering Mechanics or equivalent

2.Mathamatics -II

FABRIC MECHANICS **9 Hrs**

Fabric Mechanics: Fabric Specifications and cover factor. Plain cloth geometry - crimp ratio and thread spacing - setting theory and maximum set. Pierce's flexible and elastic thread model - Oloffson's general model. Crimp interchange in woven fabrics - crimp balance -geometrical structure of twill and mat weaves.

TENSILE PROPERTIES OF WOVEN FABRICS **9 Hrs**

Tensile properties of woven fabrics : stress-strain curve .Modeling of tensile behavior, anisotropy of woven fabric. geometrical changes during the extension of cloth - load extension modulus, Application of force, energy and finite element methods in fabric tensile behavior analysis.

9 Hrs

THEORIES ON FABRIC BENDING

Theories on Fabric Bending: Moment-curvature curve of bending, bending stiffness, bending hysteresis modeling of bending behavior, polar diagrams of

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the bending model.

FABRIC SHEAR AND COMPLEX DEFORMATION 9 Hrs

Shear stress –strain curves , relationship between shear and bending deformation, Modelling of shear behavior, Buckling , Drape- two and three dimensional drape ,fabric drape and mechanical properties, modeling of drape.

KNITTING DYNAMICS 9 Hrs

Knitting Dynamics: Yarn tension and knitting forces - effect of cam shape, increase in number of feeders and increase in linear speed. Fabric Geometry and Properties: Tightness factor - Dimensional properties - Spirality - Relaxation – shrinkage

Theory : 45 Hrs Tutorial : 00 Hrs Total: 45 Hrs

References:

1. Seyam A M, "Structural Design of Woven fabrics", Textile progress Vol.31, No: 3. Wood Head Publishing Ltd, 2002
2. Hassan M.Behery Effect of mechanical and physical properties on fabric hand" wood head publishing., ltd, 2005
3. Progress in Textiles: Science & Technology Vol. 1, Testing and Quality Management, V.K. Kothari, IAFL Publications, New Delhi, ISBN: 81-901033-0-X, 1999.
4. Ukponmwan, J, Mukhopadhyay, A, Chatterjee, K, "Pilling", Textile Progress, Vol. 28/3, ISBN: 1870372153, 1996.
5. Laing &Sleivert, "Clothing Textiles and Human Performance", Textile Progress, Vol. 32/4, 2000.
6. J Hu, "Structure and mechanics of Woven fabrics", Hong Kong Polytechnic University, Wood Head Publishing Ltd, 2004.
7. Hearle J W S, Grosberg P and Backer S, "Structural mechanics of fibres, yarn and fabrics", Wiley Interscience Publishing limited, 1969.

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P15TX*T*105/ ADVANCES IN CHEMICAL PROCESSING

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Outline the process flow for cotton fabric processing

CO2: Summarize the advanced methods of grey fabric processing

CO3: Explain the chemistry of dyeing and advanced dyeing technique

CO4: Discuss the advanced printing methods

CO5: Discover the advanced and functional finishes

Pre-requisites:

1. Textile Pretreatment and Colouration Technology
2. Textile Printing and Finishing Technology

GREY PREPARATION **9 Hrs**

Single stage grey preparation. Degradation of fibres associated with chemical pretreatment process – degradation of cotton during desizing, scouring, bleaching. Damage of wool, silk, polyester during pretreatment process. Recent developments in pretreatments.

PHYSICAL CHEMISTRY OF DYEING **9 Hrs**

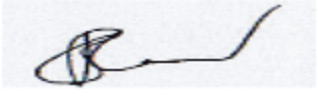
Kinetic and Equilibrium of dyeing. Adsorption isotherms- Langmuir, Freundlich and nernst isotherms. Determination of dye affinity. State of dye in solutions. Aggregation number-its determination and effect on dyeing. Use of solubility parameter concept in dyeing.

DYEING **9 Hrs**

Natural dyes & their dyeing. Antimicrobial dyes, Water repellent dyes and other fluorine containing functional dyes. Biodegradable dyes. Florescent dyes and phosphorescent colorants. Super critical fluid and CO_2 dyeing, IR dyes, Ultrasonic, magnetic dyeing. Redox and low temperature processes. Microencapsulation technology in dyeing.

PRINTING **9 Hrs**

Pigment printing-optical effect pigment, substrate based effect. Digital carpet printing. Sublimation. Thermal inkjet printing-Ink systems, Fabric pretreatments and post treatment, Jet printing machines, Limitations. Transfer



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printing, Garment printing-chest printing.Evolution of textile printing workflow, New design styles. Steamer.

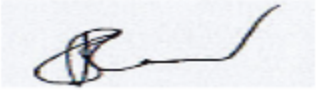
FINISHING **9 Hrs**

Use of enzymes in textile finishing - Enzymatic processing of natural fibres - Surface modification and functionalization of synthetic fibres. Comfort and health issues related to functional finishes. Super-hydrophobic nano finishes - Photocatalytic self-cleaning nano finishes - Antimicrobial nano finishes. Coating and Lamination methods.

Theory : 45 Hrs **Tutorial : 00 HrsTotal: 45 Hrs**

References

1. S R Karmakar, " Chemical Technology in the Pre-treatment processes of Textiles", Elsevier Science, 1999.
2. M Gulrajani, "Advances in the dyeing and finishing of technical textiles",The Textile Institute**,** woodhead publishing, 2013.
3. A.A. Vaidya, "Chemical Processing of Man-made Fibres and Blends", John Wiley and Sons, New York, 1984.
4. Johnson.A., "The Theory of Colouration of Textiles", SDC, Second edition, ISBN: 0901956481, 1989.
5. Chakraborty J N, "Fundamentals and practices in colouration of textiles", The Textile Institute**,** woodhead publishing, 2009.
6. Venkataraman, "Chemistry of Synthetic Dyes", Academic Press, London, 1970.
7. H Ujiie, "Digital Printing of Textiles", The Textile Institute**,** woodhead publishing, 2006.
8. Dcerrek Hey Wood, 'Textile Finishing', Society of Dyers and Colorist, 2003.



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P15TX*P*101/ ADVANCED TEXTILE TESTING LAB

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Determination of Fibre according to their different characteristics

CO2: Interpret the essential properties for Technical Textile Applications

CO3: Interpret the different mechanical characteristics of woven fabrics

CO4: Interpret the different mechanical characteristics of nonwoven fabrics

CO5: Analyze the performance of garments in relevant to different factors

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Pre-requisites:

1. Textile Quality Evaluation Laboratory
2. Fibre Analytical Laboratory

LIST OF EXPERIMENTS:

1. Identification of fibre from various methods
2. Determination of percentage of spin finish present in the fibre
3. Determination of fibre density
4. Evaluation and analysis of MVI data for differently graded cotton material.
5. Evaluation of tensile characteristics of different woven and nonwoven fabrics.
6. Evaluation of compressional characteristics of different woven and nonwoven fabrics.
7. Evaluation of bending characteristics of different woven and nonwoven fabrics.
8. Determination of wicking behavior properties of given sportswear.
9. Calculation of seam strength and seam strength efficiency with given stitches and stitch density
10. Study and assessment of seam puckering.
11. Determination of button impact strength
12. Determination of compressive strength in various composite material

Pracical : 30 Hrs **Total: 30 Hrs**

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SEMESTER II


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P15TX*T*201/ YARN QUALITY ANALYSIS

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Analyse the features and operational aspects in speed frame and ring frame for improving the evenness of the materials produced by them.

CO2: Select appropriate parameters of fibre quality and process parameters for maintaining and improving the product quality and process performance

CO3: Analyze material flow control, evenness, strength, hairiness, packing of fibres in yarns, hairiness and migration behaviour

CO4: Evaluate yarn quality on fabric wear, appearance and comfort properties.

CO5: Classify faults and their representation in spectrogram

Pre-requisites:

1. Theory of Yarn Formation
2. Textile Quality Evaluation

MASS VARIATION OF TEXTILE STRANDS 9 Hrs

Mass Variation: Determination of mass variation of textile strands in time and frequency domains- Interpretation and significance of U% and CV% for textile strands- Classification and analysis of yarn faults created by mass variations- Theoretical limit for strand regularity and index of irregularity.

VARIANCE LENGTH CURVES OF TEXTILE STRANDS 9 Hrs

Variance – Length Curves: Introduction to variance-length curves – within length and between length variance curves- Effect of specimen length and total length on mass variation measurements of textile strands; Analysis of variance-length curves to understand and avoid the introduction of mass variation during the spinning operations.

SPECTGROGRAM OF TEXTILE STRANDS 9 Hrs

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Spectrogram: Determination of periodic mass variations of textile strands in the form of spectrogram - Comparison between normal spectrum and ideal spectrum- Type of faults and their representation in spectrogram- Interpretation of superimposed waves in spectrogram- Wavelength range for each machine in a spinning mill.

TENSILE PROPERTIES OF YARN **9 Hrs**

Tensile Properties: Influence of specimen length on yarn tensile properties- Measurement and application of yarn modulus, creep and stress relaxation- Effect of testing speed on yarn tensile properties- Significance of estimating minimum yarn strength.

INFLUENCE OF YARN QUALITY **9 Hrs**

Effect of yarn properties like evenness, strength, elongation, modulus, hairiness, abrasion resistance, fibre and yarn mix-up and yarn tension history on the performance of yarn during winding, warping, weaving and knitting- Effect of yarn quality on fabric wear, appearance and comfort properties.

Theory : 45 Hrs **Tutorial : 00 Hrs** **Total: 45 Hrs**

References:

1. R.Furter, "Strength and Elongation Testing of Single and Ply Yarns", The Textile Institute, Manchester, 1985.
2. Steadman, R.G, "Cotton Testing", Textile Progress, Vol. 27, No.1.Text.Inst, ISBN: 1870812859, 1997.
3. Kothari V.K., "Progress in Textiles: Science & Technology Vol. 1, Testing and Quality Management", IAFL Publications, New Delhi, ISBN: 81-s901033-0-X, 1999.
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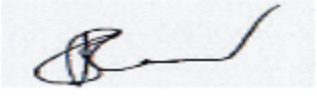

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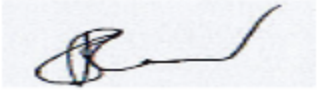
7. R.Furter, “Evenness testing in yarn production: Part I &II”, The Textile Institute,Manchester,1982.



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P15TX*T*202/ FABRIC QUALITY ANALYSIS

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Analyze the mode of fabric failure (tensile, tear, abrasion, bursting and fatigue)

CO2: Explain the influence of fibre, yarn characteristics and fabric structure on the fabric failure.

CO3: Evaluate the Role of transmission properties on thermal properties and thermal comfort

CO4: Predict fabric handle, tailorability and sewability using low stress mechanical properties of fabrics

CO5: Apply the knowledge of Dimensional Stability, Flammability, Impact Resistance, and absorbency designing technical textiles products

Pre-requisites:

1. Textile Testing
2. Physical Properties of Textile Fibres
3. Fabric structure

MECHANISM OF FABRIC FAILURE **9 Hrs**

Mode of fabric failure – tensile, tear, abrasion, bursting and fatigue. Influence of fibre, yarn characteristics and fabric structure on the fabric failure.

COMFORT PROPERTIES OF FABRICS **9 Hrs**

Role of transmission properties on thermal properties and thermal comfort. Viz., Air permeability, Water Vapour Permeability, Resistance to penetration of liquid water, resistance to flow of heat and electrical conductivity.

FABRIC APPEARANCE **9 Hrs**

Study of fabric appearance in terms of Drape, Crease Recovery, Wrinkle

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Recovery and Pilling Resistance. Influence of fibre, yarn characteristics and fabric structure on the fabric appearance.

LOW STRESS MECHANICAL PROPERTIES **9 Hrs**

Study of low stress mechanical properties during tensile, compression, bending, shear and buckling deformation. Influence of low stress mechanical properties of fabrics on fabric handle, tailorability and sewability.

OTHER PROPERTIES **9 Hrs**

Evaluation of fabric properties like Dimensional Stability, Flammability, Impact Resistance, Absorbency. Evaluation of technical textile fabrics for various applications.

Theory : 45 Hrs **Tutorial : 00 Hrs** **Total: 45 Hrs**

References:

1. Progress in Textiles: Science & Technology Vol. 1, Testing and Quality Management, V.K. Kothari, IAFL Publications, New Delhi, ISBN: 81-901033-0-X, 1999.
2. Ukponmwan, J, Mukhopadhyay, A, Chatterjee, K, "Pilling", Textile Progress, Vol. 28/3, ISBN: 1870372153, 1996.
3. Seyam, "Structural Design of Woven Fabric: Theory and Practice", Textile Progress, Vol., 31/3, 1999.
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6. Mohsen Miratbab "Fatique failure of textile fibres, wood head publishing, ltd 2009.
7. AR.Bunsell "Handbook of tensile properties of textile and technical fibres" wood head publishing ltd., 2009.
8. J.Fan and L.Hunter, "engineering apparel fabrics and garments" wood heafpublsinglitd, ISBN: 978-1-84569-134-9 (2009)
9. D.L.Bishop, "Fabrics: Sensory and Mechanical Properties", Textile

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Progress Vol. 26/3, ISBN: 1870812751, 1994.
10. Li, “The Science of Clothing Comfort”, Textile Progress, Vol., 29/3, ISBN: 1870372247, 1997.


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P15TX*T*203/TECHNICAL TEXTILES

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: List the requirements of various high performance fibres.

CO2: Memorize and indicate the structure, properties and applications of high performance fibres and high tech fibres.

CO3: Demonstrate necessary knowledge in the designing of military textiles.

CO4: Review the various fibres, fabric structures used in filter fabric designing.

CO5: Summarize the various filtration mechanisms.

CO6: Outline the properties and applications of various automotive textiles.

CO7: Explain the functions of automotive textiles in automobiles.

Pre-requisites:

1. Fibre Science
2. Nonwovens
3. Clothing Science

HIGH PERFORMANCE FIBRES **9 Hrs**

Requirements of high performance fibres. Aramid: Kevlar fibre – structure – properties and application. Nomex fibre: structure – properties and application. Polyphenylene Sulphide (PPS) fibre: properties – applications. Carbon fibres: classification - properties and applications. Glass fibres: Types and composition - properties - applications.

HIGH TECH FIBRES **9 Hrs**

Ceramic fibres: classification – composition – structure - properties and applications. Elastomeric (Polyurethane) fibre: properties - applications. HDPE fibres: properties - applications. Polybenzimidazole (PBI): structure - properties and applications. Polystyrene based fibres - properties – applications. Micro fibres: properties - applications; Poly Lactic Acid (PLA):

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properties – applications. Ultra-fine fibres and Hollow fibres: applications.

MILITARY TEXTILES **9 Hrs**

Current and Future Requirements of Soldier – Protective materials, devices and end-use requirements – role of comfort in military clothing – sweat management for military textiles –Cold weather clothing: physiological response to cold –clothing design principles – estimation of insulation – evaluation systems - selection of clothing. Designing Military clothing with high-tech materials: design process – features of military clothing - physiological monitoring - thermal management - signature management - chemical and biological defense management -flame resistance - environmental defense - body armor.

FILTRATION TEXTILES **9 Hrs**

Filtration: Introduction - definition – filtration mechanisms – classification of filter media – properties of filter media – fibres for high temperature filtration. Woven fabric media: Introduction - properties of yarns – effect of type of yarn & yarn structure on filter fabric performance – Effect of fabric weave pattern on filter fabric performance – filter fabric finishing processes – properties of woven fabric filters. Nonwoven fabric media: Introduction – Types – needle felts – electrostatic effects on nonwoven filters – bonded media: resin bonded – thermal bonded. Dry-laid spun filter media: spun bonded filter and melt blown filter. Composite nonwovens filter.

AUTOMOTIVE TEXTILES **9 Hrs**

Introduction - global scenario – Seat Belt: classification – global scenario – forces acting on passenger with and without seat belt – critical characteristics – fibres & fabric structure – manufacturing methods – performance testing. Air bags: principle of working –laws of motion – air bag inflation – types of air bags – raw materials and manufacturing methods. Filters: carburetor filter – engine oil filter – fuel tank filter - cabin filters – other filters. Tyre cord: functions – types of tyres – reinforcement materials – properties of tyre cords – manufacturing and finishing of tyre cords. Seating fabrics: property requirements - seat comfort – materials. Other minor components: headliners – hoses and belts – bonnet liners - door trims - roof trims - floor coverings –


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parcel shelves – trunk liners – dash board – sun visors – battery separators.

Theory : 45 Hrs Tutorial : 00 HrsTotal: 45 Hrs

REFERENCES

1. Derek B. Purchas, K. Sutherland (Editor) "Hand Book of Filter media", Elsevier Science & Technology Books, ISBN: 1856173755, November 2002.
2. Eugene Wilusz "Military Textiles", Wood head publications Ltd., ISBN 978-1-84569-206-3, 2008.
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4. W Fung, Collins and Aikman Automotive Fabrics and J M Hardcastle, Consultant, UK "Textiles in automotive engineering" Woodhead Publishing, ISBN 1855734931, November 2000.
5. R Shishoo, Shishoo Consulting AB, Sweden "Textile advances in the automotive industry" Woodhead Publishing, ISBN-13: 9781845693312, October 2008.
6. Mukhopadyay S.K., "High Performance Fibres", Textile Progress, Textile Institute, Manchester, Vol. 25, 1993.
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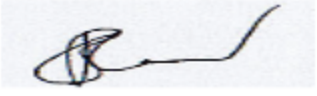

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P15TX*T*204/ CLOTHING COMFORT

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Classify textile products according to end user requirements.

CO2: List the ways of heat transmission of our body

CO3: Discuss the ways to improve moisture transmission characteristics

CO4: Selection of fibre type, yarn structure and fabric structure for sports applications.

CO5: Differentiate between water repellent and waterproof fabrics.

Pre-requisites:

1. Structural mechanics of yarn
2. Structural mechanics of fabric

CONCEPT OF CLOTHING **9 Hrs**

Need and selection of clothing - definition of comfort - components of clothing comfort - Subjective perception of comfort: Psycho-Physiological factors of clothing - Aesthetic concepts of clothing - Various aspects of clothing comfort: thermal comfort - sensorial comfort - body movement comfort. Comfort variables: Thermal and non-thermal comfort variables

THERMAL MANAGEMENT IN CLOTHING **9 Hrs**

Human-clothing-environment system - Thermo-regulation in human body - Heat balance - Heat loss - Thermoregulation through clothing system: Heat exchange through clothing. Thermal comfort of clothing - Measurement of thermal transmission characteristics - Parameters for expressing thermal characteristics - Effect of body motion and wind.

MOISTURE MANAGEMENT IN CLOTHING **9 Hrs**

Moisture transport - Liquid water transfer: wicking and water absorption -

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Principles of moisture vapour transfer - Evaluation of moisture vapour transmission - Factors affecting heat and mass transfer through fabrics- Parameters expressing heat and mass transmission- Air permeability and measurement.

COMFORT PROPERTIES OF FIBERS, YARNS AND FABRICS **9 Hrs**

Comfort properties of fibers: Physical modification of fibers - Comfort properties of yarns:Effect of yarn structure characteristics, effect of spinning technique, texturizing - Comfort properties of fabric structures: Fabric constructional parameters, finishing.

COMFORT PROPERTY OF CLOTHING **9 Hrs**

Physical Properties of Clothing and Comfort: Thermal resistance – Water vapour diffusion resistance – Water holding property – Effect of fabric properties – Radiation exchange – Flammability – Clothing with internal spaces.

Theory : 45 Hrs **Tutorial : 00 Hrs** **Total: 45 Hrs**

References:

1. Buchanan D.R, “The Science of Clothing Comfort”, Textile Progress, Vol.31, No.1/2, ISBN-13: 9781870372244, 2001.
2. FourtL.and Hollies N.R.S., “Clothing – Comfort and Function”, Marcel Decker, New York, 1970.
3. Laing R.M., and Sleivert G.G., “Clothing, Textiles and Human Performance”, Textile Progress, Vol.32, No.2, 2002.
4. Ukponmwan J.O., “The Thermal Insulation Properties of Fabrics”, Textile Progress, Vol.24, No.4, 1992.
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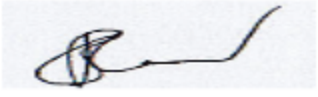
7. G.song, “Improving comfort in clothing”, woodhead publishing services in textiles No: 106, ISBN: 184569 539, Jan 2011



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P15TX*P*201/ ANALYTICAL STUDY

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Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Formulate a critical and logical textile applied study in a vivid manner

CO2: Demonstrate the implied analysis/research in the above defined study

CO3: Experiment the defined variables using suitable statistical tools.

CO4: Analyze and conclude the implied and aimed inferences and relationships in the above experiment/research

CO5: Discuss and explain the outcomes of the research/analytical study.

Pre-requisites:

1. Statistical Application in Textile Engineering

Student should undertake in depth study of a subject of outside the regular courses offered in the programme. The study should be carried out under the guidance of a faculty member. The Subject area chosen by the student should be sufficiently different from the area of project to be persued by the student in the succeeding semesters. Student must submit the detailed plan of work to the **Independent Study coordinator** before one week from the last instruction day of previous semester. The evaluation will be based on the seminars (3 nos.) presented before **review committeeand its coordinator** during the semester and report submitted as well as viva-voce presented at the end of the Semester before **internal & external valuators**. The valuation pattern is as follows.

Particulars	**Maximum Marks**	**Minimum Marks**
CAM	50	0
End Semester Valuation (Project Report & Viva Voce)	100	50
Total	100	50

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Practical: 30 Hrs **Total: 30 Hrs**

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SEMESTER III

L	T	P	C
3	0	0	3

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P15TX*T*301/ RESEARCH METHODOLOGY

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Recall and relate the basic concepts of research problem, design, data collection & interpretation, Scaling and report writing.[K1]

CO2: Explain and compare various types of research problems, design, data collection & interpretation, Scaling and report writing.[K2]

CO3: Demonstrate oral presentation.[K2]

CO4:illustrate the report writing of students from the mock projects. [K2]

CO5: Discuss through seminars/group discussions on the research problem, design, data collection & interpretation, Scaling and report writing.[K5]

Pre-requisites:

1. P14TXT105/Statistical Application in Textile Engineering
2. P14TXP102/Statistical Analysis Laboratory

RESEARCH OBJECTIVES AND DEFINING THE RESEARCH PROBLEM **9 Hrs**

Literature review-identification and selection of problem – Formulation. Research methodology - definition, mathematical tools for analysis, types of research, exploratory research, conclusive research, modeling research, algorithmic research, research process – steps.

RESEARCH DESIGN AND EXPERIMENTAL DESIGN **9 Hrs**

Meaning, purpose and principles of research design – Design criteria- Different types of research and experimental design.

METHODS OF DATA COLLECTION, MEASUREMENT AND SCALING TECHNIQUES **9 Hrs**

Sources of data –data collection methods - primary data – observation method – personal interview – telephonic interview – mall survey – questionnaire design. Observation, questionnaire and interviews. Measurement scales –

scaling techniques – scale constitution techniques – contact analysis.

PROCESSING AND ANALYSIS OF DATA **9 Hrs**

Processing operation-problems in processing-types of analysis-hypothesis testing - testing of hypotheses concerning means (one mean and difference between two means – one tail and two tails tests)

INTERPRETATION AND REPORT WRITING **9 Hrs**

Meaning and Techniques of interpretation – Types of report – guidelines to review report – typing instructions – oral presentation - Significance of report writing – Case studies.

Theory : 45 Hrs **Tutorial : 00 Hrs** **Total: 45 Hrs**

REFERENCES

1. Sedhu. A.M. and Singh A., "Research Methodology in Social Sciences", Himalaya Publishing House, Mumbai, 1980.
2. Bailey, Kenneth D., "Methods of social research", New York, 1978.
3. Best, John W., and Kahn, James V., "Research in education", 5th Ed., New Delhi: Prentice-Hall of India Pvt. Ltd., 1986.
4. Emory, C.William, "Businees Research Methods", Illinois: Richard D.Irwin, Inc. Homewood, 1976.
5. Ullman, Neil R., "Elementary statistics", New York: MCGraw-Hill, 1970.
6. Kothari C.R., "Research Methodology, Methods and Techniques", Wiley Eastern, New Delhi, 1990.
7. Panneerselvam.R, "Research Methodology", Printice Hall of India, New Delhi, 2004.

P15TX *P*301 **Project Work-Phase I**

L	T	P	C
0	0	12	6

Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Identify a problem in textile engineering field through literature survey.
CO 2: Construct a design to overcome its problems
CO 3: Make use of analysis, to confirm the identity
CO 4: Develop and analyse the product
CO 5: Select the optimum design

Pre-requisite course(s):

1. Knowledge in Design and Fabrication of component


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SEMESTER IV

P15TX *P401* **Project Work-Phase II**

L	T	P	C
0	0	24	12

Course Outcomes

After successful completion of this course, the students should be able to

CO 1: Perform methodology using appropriate tools for the problem.
CO 2: Analyze data and interpret the results obtained.
CO 3: Identify the process the fabrication / manufacturing.
CO 4: Experiment of the model developed.
CO 5: Summarize the results and submit a report.

Pre-requisite course(s):

1. Knowledge in Design and Fabrication of component

ELECTIVES


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L	T	P	C
3	0	0	3

P15TX*T*E01/ TEXTILE POLYMER RHEOLOGY

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Summarize the basics of fluid flow

CO2: Analyse the effect of molecular parameters on the fluid flow

CO3: Describe the rheology of fluid

CO4: Explain the working of rheological method

CO5: Characterize rheological behaviour of fluids

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Pre-requisites:
Nil

BASICS **9 Hrs**

Basic modes of deformation, Startup deformation, Step strain, Oscillatory shear; Linear responses-Elastic Hookean solids, Viscous Newtonian liquids and non Newtonianfluids;Viscoelastic responses - Boltzmann superposition principle, Maxwell model ; Classical Rubberelasticity.

POLYMER VISCOSITY **9 Hrs**

Viscosity-Effect of Pressure, temperature, activation energy, molecular weight and molecularweight distribution on viscosity, crosslinking, crystallinity branching, copolymerization, fillers,plasticizers and shear rate dependence of viscosity.

RHEOLOGY OF FLUID **9 Hrs**

Laminar flow through various profiles,flow analysis - power law, turbulent flow analysis, turbulence dumpling.; rheological models for extensional viscosity; Flow in coni-cylindrical dies – pressure drop due to shear, extensional flow and pressure drop at die entry, flow in wedge shaped die; Swelling due to shear stresses and swelling due to tensile stresses.

RHEOLOGICAL METHOD **9 Hrs**

Shear rheometry- Linear displacement, Sliding plate rheometer, Co-cylinder axial sliding rheometer; Rotational motion - Parallel disks, Cone-plate and. Cone-partitioned plate; Rheooptical methods- Flow birefringence, Scattering (X-ray, light, neutron), Spectroscopy (NMR,fluorescence, IR, Raman, dielectric)

RHEOLOGICAL BEHAVIOUR **9 Hrs**

Rheological behaviour of important thermoplastics, Applications of rheology to polymer processing.


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Theory : 45 HrsTotal: 45 Hrs

References:

1. Brydson J.A., “Flow properties of polymer melts”, life books, London, 1978.
2. Richard C. Progelhof and James L. Throne, “Polymer Engineering Principles”, Hanser Publishers, New York, 1993.
3. John M. Dealy and Kurt F. Wissburn, “Melt rheology and its role in plastics Processing”, Chapman, London, 1995.
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5. Crawford R.J., “Plastics Engineering”, Butterworth – Heinemann, Oxford, 1998
6. Ferry J.D., “Viscoelastic Properties of Polymers”, John Wiley & Sons, New York, 1986.
7. Chang Dae Han, “Rheology in Polymer Processing”, Academic Press, New York, 1976

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3	0	0	3

P15TX*T*E02 /CHARACTERIZATION OF TEXTILE POLYMERS

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Characterize the molecular weight of polymer

CO2: Describe the molecular structure characterization of polymer

CO3: Explain the thermal characterization of polymer

CO4: Describe the other structure characterization of polymer

CO5: Interpret data obtained from various analytical instruments

Pre-requisites: Nil

MOLECULAR WEIGHT 9 hrs

Polymer solution thermo dynamics; molecular weight and molecular dimensions by end group analysis, osmometry, light scattering, viscometry, gel permeation chromatography, high performance liquid chromatography.

MOLECULAR STRUCTURE CHARACTERISATION 9 Hrs

Infrared, NMR, UV–visible, Raman spectroscopy, mass spectroscopy

THERMAL PROPERTIES 12 Hrs

Thermal properties by differential scanning calorimetry, differential thermal analysis, thermo

gravimetry, thermo-mechanical analyzer, dynamic mechanical and dielectric analysis

OTHERS 15 Hrs

Optical and electron microscopy; TEM, SEM, AFM, X-ray scattering from polymers, birefregence, crystallinity by density measurements, Surface area, pore volume measurements by B.E.T. method, porosimetry, surface energy measurements and particle size measurement.

Theory : 45 Hrs Total: 45 Hrs

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References:

1. Gupta V.B. and Kothari V.K., “Man Made Fibre production,” Chapman and Hall, 1985.
2. Bill mayer, “Textbooks of Polymer Science,” 3rd ed., Wiley, 1984.
3. Sperling, “Introduction to Physical Polymer Science,” Wiley, 1986.
4. Campell D. and White J.R, “Polymer characterization, Physical Techniques”, McGraw –Hill, New York, 1969.
5. Stamm M., “Polymer surfaces and Interfaces”, Springer1st ed., 2008.

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P15TX*T*E03/ THEORY OF COLOURATION

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Outline the chemistry of textile fibres

CO2: Discover the application of thermodynamic laws and functions in colouration

CO3: Summarize the chemical principle involved in colouration process

CO4: Explain the theory of dyeing and dye-fibre bond

CO5: Examine the colour recipe/strength using CCM

Pre-requisites:

1. Advances in chemical processing
2. Textile pretreatment and colouration

FIBRE CHEMISTRY **9 Hrs**

Chemical structure of textile fibres – Effects of acids, alkalies, enzymes and solvents on textile fibres – study of mechanism of desizing, scouring, bleaching and mercerizing of textile fibres.

PHYSICAL CHEMISTRY **9 Hrs**

First law of thermo dynamics and its application in thermo chemistry-Second law of thermo dynamics - free energy - thermodynamics of solutions - surface adsorption - adsorption at interface - activity of dye affinity – substantivity - heat of dyeing and entropy. Donor Membrane Equilibrium - order of reactions

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PHYSICAL AND CHEMICAL STRUCTURE OF FIBRES AND DYE UP-TAKE **9 Hrs**

Effect of orientation, crystallinity, chemical structure and chemical modification of fibres Surface energy and interfacial effects on kinetics and equilibrium of sorption of solvent and dye molecules.

DIFFUSION AND RATES OF DYEING: **9 Hrs**

Fick's laws - of diffusion, diffusion in the steady and non-steady state - boundary layers in diffusion - diffusion in final bath - parameters that affect diffusion and rates of dyeing - diffusion coefficient and concentration - activation energies of diffusion.

COLOUR ASSESSMENT IN TEXTILES: 9 Hrs

Theories of colour measurement, Beer–Lambert's law and Kubelka-Munk theory; techniques of computer color matching; prediction of color recipe; limitations of computer color matching.

Theory : 45 Hrs Total: 45 Hrs

References:

1. Peters A T and Freeman H S, "Physico – Chemical Principles of Colour Chemistry", SpringerVerlag New York, ISBN: 9780751402100, 1996.
2. Broadbent A, "Basic Principles of Textile Colouration", SDC, 2001. ISBN: 978 0 901956 76 7
3. Shore J, "Blends Dyeing", SDC, ISBN: 978 0 901956 74 3, 1998.
4. M Gulrajani, "Advances in the dyeing and finishing of technical textiles", The Textile Institute, woodhead publishing, 2013.
5. A.A. Vaidya, "Chemical Processing of Man-made Fibres and Blends", John Wiley and Sons, New York, 1984.
6. Johnson A, "The Theory of Colouration of Textiles", SDC, Second edition, ISBN: 978 0 901956 48 4, 1990.
7. Shah H S and Gandhi R S, " Instrumental Colour Measurements and Computer Aided Colour Matching", Mahajan Book Distributors, ISBN: 978-8185401003, 1990.

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P15TX*T*E04/ ENZYME TECHNOLOGY FOR TEXTILE PROCESSING

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Confer the rationale for selecting enzymes for particular processing and

CO2: Realize limitations of existing processing operations using chemicals

CO3: Describe the principle of enzyme action

CO4: Explain the application of enzyme in pre-treatment of textile material

CO5: Explain the application of enzyme in textile effluent treatment

Pre-requisites: Nil

ENZYMES **9 Hrs**

Nomenclature and classification of enzymes; characteristic features of enzymes; modifiers ofenzyme activity - activators and inhibitors; specificity of enzyme action; extraction andpurifications of enzymes.

ENZYME KINETICS

Kinetics of single-substrate enzyme-catalysed reactions; Basics of kinetics of multi-substrateenzyme-catalysed reactions.

ENZYMES FOR COTTON FIBRE **9 Hrs**

Chemistry and structure of cotton fibre; enzymes in pretreatment of cotton substrates –desizing, scouring, bleaching and bio finishes.

ENZYMES FOR OTHER FIBERS **9 Hrs**

Enzymes for processing and functionalizing protein fibres; enzymatic modification of polyester, polyamide, polyacrylonitrile and cellulose acetate fibres.

ENZYMES IN EFFLUENT TREATMENT **9 Hrs**

Enzyme technology and biological remediation, Enzyme decolourisation and decolouration by biosorption and enrichment cultures.

Theory : 45 Hrs **Total: 45 Hrs**

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References:

1. Freifelder D., "Molecular Biology ", Jones and Bartlett Publishers Inc. 1987.
2. Nierstrasz V. and Cavaco-Paulo A., “Advances in textile biotechnology”, Woodhead
   Publishing Ltd, Cambridge, UK, 2010.
3. Cavaco-Paulo A. and Gubitz G., “Textile processing with enzymes”, Woodhead Publishing Ltd, Cambridge, UK, 2003.

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P15TX*T*E05/ ADVANCES IN TEXTILE FINISHING

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Explain the various finishing methods involved in fabric processing

CO2: Discuss the mechanism and chemistry of finishing

CO3: Summarize the functional finishes and its application

CO4: Identify the specialty polymers in finishing of fabric

CO5: Test the chemical finished fabric

Pre-requisites:

1. Textile Pretreatment and Colouration Technology
2. Textile Printing and Finishing Technology

EASY-CARE AND DURABLE PRESS FINISHES 9 Hrs

Commercial importance of finishing and its classification. Concepts of anticrease finish, Esterification and etherification, Mechanisms and chemistry of easy-care and durable press finishes- Formaldehyde and non-formaldehyde containing product, cross linking agent and catalyst, problem of formaldehyde release. Developments in resins, Application methods, Compatibility with other finishes, Evaluation methods. Trouble shooting and practical problems.

SOFTNERS AND SURFACTANT IN FINISHING 9 Hrs

Methods of softening, Chemistry of softeners, Application of softening techniques to technical textiles, Effect of softeners on textile properties, Environmental impact of softeners, Measurement of fabric softness. Raw materials for surfactants, Cationic and non ionic surfactants, Novel surfactants, Applications of surfactants.

FLAME RETARDANT AND WATER REPELLENT FINISHES 9 Hrs

Burning behaviour of polymers and ways to affect flame retardancy, Condensed phase and gas phase mechanisms of FR. Classification, application and developments in flame redardants. Test methods for fire resistance. Mechanisms of water repellency, Repellent chemistry, Evaluation of textile

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treated with repellent finishes, Troubleshooting repellent finishes and particularities.

FUNCTIONAL FINISHES **9 Hrs**

Soil release finish-mechanisms of soil release, Soil release chemistry, Evaluation of soil release. Anti-microbial finish- mechanism and chemistry, evaluation methods. Anti-static finish- mechanism & chemistry, conductive fibres, evaluation methods. Anti-pilling finish- mechanism and chemistry, evaluation methods. UV finish- mechanism and chemistry, evaluation methods.

SPECIALITY POLYMERS IN FINISHING **9 Hrs**

Speciality polymer- Temperature responsive breathable coating. Bioactive finishes for protection against biological attack and other medical applications. Finishes for conductive textiles. Advances in application of speciality finishes/ coatings. Foam Finishing- Detailed study of various techniques of foam application. Drawbacks of foam finishing.

Theory : 45 Hrs **Total: 45 Hrs**

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. Marsh, J.T., “An Introduction to Textile Finishing”, Chapman and Hall Ltd., London, 1979.
4. From waste to Profits, Technical Manual Series III, National Productivity Council, New Delhi, 1998.
5. Heywood, “Textile Finishing”, Woodhead Publishing Limited, 2003.
6. Gulrajani M L, “Advances in the dyeing and finishing of technical textiles” Woodhead Publishing Limited, 2013.
7. Schindler W D and Hauser P J, “Chemical finishing of Textiles” Woodhead Publishing Limited, 2004.

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P15TX*T*E07/ TEXTILE COMPOSITES

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Define the composites and various constituents of composite material
CO2: Classify the composites based on reinforcement and matrix.
CO3: Explain the various composites manufacturing technologies.
CO4: Outline the Various Interfacial mechanisms.
CO5: Show knowledge in mechanics of composites
CO6: Describe the various testing's performed in composite materials.
CO7: Summarize the various applications of composites.

Pre-requisites:
1. Physical properties of Textile Fibres
2. Technical Textiles

COMPOSITES REINFORCEMENT AND MATRICES 9 Hrs

Composites: introduction – definition – classification based on reinforcement and matrix - constituents. Matrix: thermoplastic and thermosetting matrices – properties – limitations – comparison - applications. Reinforcement Types – MMC, CMC, PMC – properties – limitations-applications. Textile Reinforcement Forms – fibre, roving, fabric, mat, braid, etc. - properties – applications. High performance fibres: aramid- glass – boron – carbon. Prepregs and Preforms: properties – manufacturing. Testing of Reinforcement and Matrices.

COMPOSITES MANUFACTURING TECHNOLOGIES 9 Hrs

Lay-up & Automatic lay-up: working principle – advantages – limitations – applications. Resin Transfer Moulding: principle of operation – resin system & injection – mold materials - resin flow strategies - advantages – limitations – applications. Filament winding: principle of working – geometry of winding – types of winding – mandrels - advantages – limitations – applications. Pultrusion: process equipments - principle of operation – pull forming - advantages – limitations – applications. Consolidation techniques: Vacuum bagging – Pressure bagging.

DESIGN OF STRUCTURE WITH COMPOSITES 9 Hrs

Interface: definition – conditions for good interfacial reactions - interface mechanisms - surface treatments. Design of Composites: material selection -


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configuration selection – design requirements – design load definitions – optimization concepts - laminate design.

MECHANICS AND TESTING OF COMPOSITES 9 Hrs

Geometric and Physical definitions. Lamina and Laminate: definition - angle of orientation mass density and ply thickness, fibre volume fraction (FVF) - critical fibre length - rule of mixture. Fibre Composites: strength and failure – fracture toughness – fatigue – impact – delamination – moisture expansion – conductivity – damage and failure modes. Testing of Composites: Destructive testing: tensile - compression – bending - shear – impact – ignition loss & matrix digestion – accelerated weathering test.

APPLICATIONS OF COMPOSITES 9 Hrs

Land Transport Applications: Automotive applications – rail road applications – mass transit applications – military applications. Marine Applications: boats – large power yachts – sail boats – pressure hulls – sonar domes – fairings – control surfaces – decking – pipes. Industrial Applications: antennas – bridges – cable cars – electrical and electronics. Composite Biomaterials: orthopaedic implants – femoral components for total hip arthroplasty – bone cement, articulation components. Construction applications: rebars – prestressing – rehabilitation – platforms – pedestrian bridges – cooling towers. Other applications: aircrafts, sports goods and aerospace.

Theory : 45 HrsTotal: 45 Hrs

References:

1. GüneriAkovali, “Hand book of Composite Fabrication” Rapra technology Ltd., UK, ISBN: 1-85957-263-4, 2001.
2. Isaac M.Daniel, OriIshai, “Engineering mechanics of Composite Materials”, Oxford University Press, UK, 1994.
3. A. Brent Strong, “Fundamentals of Composites Manufacturing” Society of Manufacturing Engineers, 2008.
4. Mel M. Schwartz, “Composite materials handbook” McGraw-Hill, 1992.
5. Stuart M. Lee, “International encyclopedia of composites” VCH, 1999.
6. S.T. Peters, Chapman & Hall, “Hand Book of Composites”, Second

Edition, ISBN 0 412 54020 7, 1998.
7. Robert M.Jones, Taylor & Francis, "Mechanics of Composite Materials", Second Edition, 1999.

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P15TX*TE*07/ TEXTILE EFFLUENTS MANAGEMENT

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Elaborate on hazards due to pollutants from textile chemical processing industry

CO2: Discuss about functions and applications of enzymes

CO3: Explain the method of treatment of pollutants

CO4: Propose managing pollutants as per Government regulations and

CO5: Formulate methods of green processing

Pre-requisites:

1. Advances in Chemical Processing
2. Textile Chemical Processing
3. Chemistry for Textiles

INTRODUCTION **9 Hrs**

Textile Effluent Introduction - Textile waste characteristics- wastewater problems - Chemicals used in textile industry-treatment of textile effluents. Textile processing chemistry. Textile raw materials – files, chemicals, types of textile chemical processing properties, mercerization, coloring, finishing chemical operations – mechanical operations.

EFFLUENT TREATMENT **9 Hrs**

Pollution control at mill stage, waste stress – cotton, wool, water & chemical recovery and rinse – cotton, wool, synthetics, waste water treatment std for textile effluent – nature of the problem – treatment systems – effluent treatment systems – rural area, urban area.

TECHNIQUES FOR EFFLUENT TREATEMENT **9 Hrs**

Techniques for effluent treatment - Chlorine dioxide treatment, ozone treatment, membrane technology – micro filtration, ultra filtration, nano filtration, reverse osmosis, electro dialysis, enzymatic de- coloration, bio mass based Technologies – waster water de coloration, chitin and chitosan, sorption of dyes, study of dye binding properties other bio-mass systems.

TESTING **9 Hrs**

Parameters and pollutants, testing of pollution parameters, regulations in developed countries-eco-friendly processing-effluent quality assurance programme-waste auditing and minimization-elements of a waste minimization assessment-programme initiation waste audit- feasibility analysis-monitoring and re-evaluation.

EFFLUENT MANAGEMENT **9 Hrs**

Color removal technologies-biotechnology approach-color and organic pollutant removal – anaerobic –aerobic treatment process – sludge

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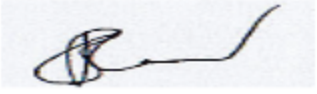
management – source reduction of sludge, bio elimination through sludge, solids separation, and solid waste disposal of textile industry – government regulation for effluents – S Bureau of Indian standards.

Theory : 45 Hrs **Total: 45 Hrs**

References:

1. Best Management Practices for Pollution Prevention in the Textile Industry –Manual by US Environmental Prevention Agency, 1996.
2. K.Slater, "Environmental Impact of Textiles" , Wood head publication,2003.
3. Pollution Prevention in Textile Industry manual by U.S EPA/SEMARNAP Pollution prevention work group, 1996.
4. S.C.Bhatia "Handbook of Industrial Pollution and Control (Vol. 1 & 2), CBS edition, 2002.
5. Peter I Norman and Roy Seddon , Low Moor, " Pollution Control in the Textile industry –the chemical auxiliary manufacturer's role", Allied Colloids plc, Bradford , UK, Journal of Society of Dyers and Colourists, Volume 107 May/June 1991.
6. "Textile Effluent" Padma S. Vankar I.I.T. Kanpur.
7. H.R. (Harold R.), Park Ridge. N.J, "Pollution Control in the Textile Industry", Jones Noyes Data Corp., 1973.



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P15TX*T*E08/ DESIGN AND ANALYSIS OF TEXTILE EXPERIMENTS

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Design the experiment suitable for a given study

CO2: Conduct statistical tests and analyze the results to arrive at the conclusions.

CO3: Analyze the tested data with appropriate statistical tool

CO4: Use advanced experimental design

CO5: Interpret the data and graphical representation

Pre-requisites: Nil

EXPERIMENTAL DESIGN FUNDAMENTALS 9 Hrs

Importance of experiments, experimental strategies, basic principles of design, terminology,ANOVA, steps in experimentation, sample size, normal probability plot, linear regression model.

SINGLE FACTOR EXPERIMENTS 9 Hrs

Completely randomized design, Randomized block design, Latin square design. Statisticalanalysis, estimation of model parameters, model adequacy checking, pair wise comparisontests, in respect of textile process, machine and quality parameters.

MULTIFACTOR EXPERIMENTS 9 Hrs

Two and three factor full factorial experiments, 2K factorial Experiments, Confounding andBlocking designs; application in textile experiments

SPECIAL EXPERIMENTAL DESIGNS 9 Hrs

Fractional factorial design, nested designs, Split plot design, Introduction to Response Surface Methodology, Experiments with random factors, rules for expected mean squares, approximate F- tests for textile applications.

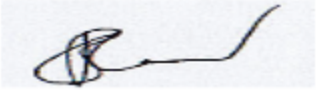
TAGUCHI METHODS 9 Hrs

Steps in experimentation, design using Orthogonal Arrays, data analysis, Robust design- control and noise factors, S/N ratios, parameter design, case studies related to textile engineering.

Theory : 45 Hrs Total: 45 Hrs

References:

1. Montgomery, D.C., Design and Analysis of experiments, John Wiley and Sons, 2003.
2. NicoloBelavendram, Quality by Design; Taguchi techniques for industrial experimentation, Prentice Hall, 1995.
3. Phillip J.Rose, Taguchi techniques for quality engineering, McGraw Hill, 1996.
4. Leaf G.A.V., “Practical Statistics for the Textile Industry, Part I and II”, The Textile Institute, Manchester, 1984, ISBN:0900739517.



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P15TX*T*E09/ ADVANCEMENTS IN MEDICAL TEXTILES

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Recall and relate the basic concepts of biopolymers, wound dressing & its testing, reusable textiles, implants, cosmetic, odour textiles bandages,medical filters, super absorbents, tissue engineering, drug release and smart textiles.[K1]

CO2: Explain various biopolymers, wound dressing & its testing, reusable textiles, implants, cosmetic, odour textiles bandages, medical filters, super absorbents, tissue engineering, drug release and smart textiles. [K2]

CO3: Classify various biopolymers, wound dressing & its testing, reusable textiles, implants, cosmetic, odour textiles bandages, medical filters, super absorbents, tissue engineering, drug release and smart textiles. [K2]

CO4: Compare various biopolymers, wound dressing & its testing, reusable textiles, implants, cosmetic, odour textiles bandages, medical filters, super absorbents, tissue engineering, drug release and smart textiles.[K4]

CO5: Discuss through seminars/group discussions on the biopolymers, wound dressing & its testing, reusable textiles, implants, cosmetic,

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odour textiles bandages, medical filters, super absorbents, tissue engineering, drug release and smart textiles.[K5]

Pre-requisites:

1.TextileFibres

2. Basics in Medical Textiles

MEDICAL TEXTILES AND BIOPOLYMERS 9 Hrs

Medical textile products: properties, contacting behavior and transmission properties, engineering stability and compactness; Anti microbial agents: various forms & types; Structures and applications of nonwovens in medicine; Biopolymers from natural origins: polysaccharides, proteins, lipids-polyesters synthesized from bio-derived monomers -polymers from sugars-biopolymers from mineral origin-aliphatic polyester-aromatic polyester –PVA -modified polyolefin; PLA: rheological, thermal and mechanical properties; Biomaterials: invitro assessment of tissue compatibility by assay methods –invitro assessment of tissue compatibility.

WOUND DRESSING AND TESTING 9 Hrs

Wound healing mechanism; wound dressing concept, structures, design criteria for wound coverage, material selection, types of dressing material- Interactive wound dressings: principles, types and structures of bioactive wound dressings –silver containing wound dressings-Delivery drugs to wounds- composite wound dressing: structures, materials & types-High tech wound dressing – Non-adherent dressings- odour absorption dressings-Antimicrobial wound dressing - Testing of dressing and wound handling materials: Fluid handling – Low adherence –Conformability –microbiological -odour control –biological tests.

REUASABLE TEXTILES, IMPLANTS, COSMETIC AND ODOUR TEXTILES 9 Hrs

Reusable medical textiles: types, advantages - processing procedures – healthcare cost analysis; Textile implants : hernia mesh – vascular prosthesis –

stents; Regenerative textile: materials, structures, cells- applications in cartilage, nerves & liver; Cosmetic textiles: application and release technology-functionalities –performance testing; Odour control textiles: measurement – qualitative description of wound and body odours – instrumental evaluation – antimicrobial efficacy test – control of odour with textiles

BANDAGES, MEDICAL FILTERS AND SUPER ABSORBENTS **9 Hrs**

Compression therapy and elastic compression bandages: types, relationship between compression and pressure- ideal bandage pressure –novel bandages-applications- 3D Compression bandages; Medical filters: Hollow fibre bioreactors- measurement of diffusion / hydraulic permeability, pore size and distribution and surface properties; Super absorbents – chemical structure-forms-properties- applications in medicine, hygiene and comfort improvement.

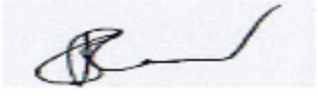
TISSUE ENGINEERING, DRUG RELEASE AND SMART TEXTILES **9 Hrs**

Tissue engineering: principle, properties and materials of fibrous scaffolds – relationship between textile architecture and cell behavior; Drug releasing textiles: classification – fabrication –characterization. Drug delivery system: Diffusion control delivery systems – water penetration controlled system - chemically controlled devices – regulated system; Sutures: Categories and characteristics-structures and materials; Phase change and shape memory Textiles: physical effects, material, applications; Use of electronics: power management, materials and application.

Theory : 45 Hrs **Total: 45 Hrs**

References:

1. Buddy D.Ratner, “Bio material Science-An Introduction to Material in Medicine”, Academic Press,1996.
2. Van Lagenhove , “Smart Textiles for Medicine and Health care –



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Materials, System and Application," Wood head Publishing, 2007.
3. Rajendran .S and Anand .S.C, "Developments in Medical Textiles," Textile Progress,Vol.32,No.4, 2006.
4. V.K.Kothari, "Progress in Textiles: Science & Technology", Vol. 3, IAFL Publication, 2008.
5. G.E.Cusick and Teresa Hopkins, "Absorbent Incontinence Products", Textile Institute, 1990.
6. Pour deyhimi B, "Vascular grafts: Textile Structures and Their Performance", Textile Progress, Vol.15, No.3, 1986.
7. Bartel .V.T, "Hand Book of Medical Textiles," The Textile Institute and Wood head Publishing, 2011.
8. Rajendran .S, "Advanced Textiles for Wound Care," Wood head Publishing,2009.


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P15TX*T*E10/ PROTECTIVE CLOTHING FOR HAZARDOUS ENVIRONMENT

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Analysing the fibres with respect to geometry, composition and orientation.

CO2: Knowing the effect of moisture on textiles.

CO3: Study on the roles of moisture and heat on fabric.

CO4: Understanding the garment designs used for chemical protective clothing.

CO5: Study the heat exchange and comfort aspects of human skin.

Pre-requisites:

1. Technical Textiles
2. Fibre Science
3. Clothing Comfort

FIBRE STRUCTURE AND GEOMETRY **9 Hrs**

Fibre Structure and Geometry: Geometrical characterization of single fibers; basic parameters for porous media; characterization of fibrous materials; mathematical descriptions of the anisotropy of a fibrous material; pore distribution in a fibrous material; torbuosity distributions in a fibrous material; structural analysis of fibrous materials with special fiber orientations.

MOISTURE IN TEXTILES **9 Hrs**

Moisture in Textiles: Surface tension, wetting and wicking- adhesive forces and interactions across interfaces; rate of change of moisture content; wetting phenomena in fibrous materials- curvature effects of surfaces; capillarity; interactions between liquid and fibrous materials- complete wetting of curved surfaces, liquid spreading dynamics on a solid surface.

HEAT –MOISTURE INTERACTIONS **9 Hrs**

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Heat &Moisture Interactions: heat transfer and moisture diffusion in fibrous materials- thermal conduction analysis, moisture diffusion; effect of fabric physical properties on the condensation/evaporation process; heat-moisture interactions and phase change in fibrous material- moisture regain and equilibrium relationships, sorption and condensation, mass and heat transport processes

CHEMICAL PROTECTIVE CLOTHING 9 Hrs

Chemical Protective Clothing: protection from chemical hazards; chemical protective clothing- barrier effectiveness of chemical protective clothing, performance evaluation of chemical protective clothing, human exposure assessment, decontamination and reuse; refurbishment factors- chemical, thermal and mechanical energies.

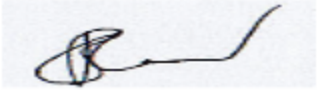
THERMOREGULATION AND COMFORT 9 Hrs

Thermoregulation and Comfort: Introduction; structure of skin; heat exchange at the skin surface; moisture exchange at the skin surface; sensation and comfort; modeling human thermal regulation and comfort- phase change in fabrics.

Theory : 45 Hrs Total: 45 Hrs

References

1. Pan N and Gibson P., "Thermal and moisture transport in fibrous materials", Woodhead Publishing limited and CRC press LLC, ISBN-13:978-1-84569-057-1.
2. MasturaRaheel., "Protective Clothing Systems and materials", Marcel Dekker, Inc. NewYork. Basel. HongKong, ISBN: 0-8247-9118-5, 1994.
3. Slater K., Textile Progress "Comfort properties of textiles", A review published by the Textile Institute, Vol. 9/4, ISSN: 0040-5167, 1977.
4. Hearle J.W.S and Peters R.H., "Moisture in Textiles", Butterworths Scientific Publications, Manchestor, 1960.



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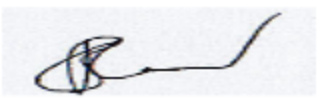
P15TX*T*E11/ TEXTILES IN CIVIL CONSTRUCTION AND TRANSPORTATION

Course Outcomes (COs):

After successful completion of this course, the students should be able to



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CO1: Comprehend the requirements of textiles used for civil construction
CO2: Design the textile materials for civil construction applications.
CO3: Comprehend the requirements of textiles used for transportation applications
CO4: Design the textile materials for transportation construction applications
CO5: Describe the evaluation method of textile material

Pre-requisites: Nil

GEO TEXTILES **15 Hrs**

Geo textile – definition, types, functions; types of fibers and fabrics used in geo textiles; applications of natural fibers in geo-textiles; joining of geo-textiles; multi functional uses of geo synthetics in civil engineering; usage of geo-synthetic in civil engineering applications as filters, reinforcement, separation and drainage medium; material specifications and design criteria of geo-synthetics for specific applications.

ARCHITECTURE TEXTILES **15 Hrs**

Fiber and fabric property requirements for architecture textiles; Coated textiles; Tents, Awnings and Canopies; Inflatable structures – high pressure and low pressure inflatable structures; Textile for roofing applications; Acoustic and heat insulation textiles; Floor and wall covering, scaffolding nets.

TRANSPORTATION TEXTILES **9 Hrs**

Quality and design of textile materials used in automobiles – tire cord, filter, air bag, belt, seat cover, noise insulation; Design and development of textile reinforced composites in automobile and aeronautic industry.

EVALUATION **6 Hrs**

Evaluation of textile material used in civil construction and transportation industry in terms ofperformance, construction surviability and durability.

Theory : 45 Hrs **Total: 45 Hrs**

References:

1. Horrocks A.R. and Anand S.C., “Handbook of Technical Textiles”, The Textile Institute, Manchester, 2000, ISBN: 1855733854.
2. R. W. Sarsby, “Geo Synthetics in Civil Engineering”, Woodhead Publishing, ISBN-13: 978-1-85573-607-8
3. Mukhopadhyay S.K. and Partridge J.F., “Automotive Textiles”, Textile Progress, Vol.29,No1/2, 1999, ISBN:1870372212.
4. Adanur S., “Wellington sears handbook of Industrial textiles”, Technomic publishing co inc.,1995, ISBN : 1–56676–340–1.
5. Eugeniooñate and Bern kröplin “Textile Composites and Inflatable Structures”, Springer Dordrecht, Berlin, Heidelberg, New York, ISBN-10 1-4020-3316-8

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P15TX*TE*12/ CONTROL SYSTEMS AND AUTOMATION IN TEXTILE ENGINEERING

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Analyze the production variation using computerized processing
CO2: Explain control system & automation used in Textile Industry
CO3: Describe different control systems used in the Textile Industry
CO4: Discuss about computerized processing in Textile Industry
CO5: Elaborate Industrial Automation in Textile Industry

Pre-requisites:

1. Industrial Instruments and Process Control
2. Automation in Textile Industry

INTRODUCTION ABOUT CONTROL SYSTEM 9 Hrs

Instrumentation and Transducers: Functional Description of Instruments; Types and applications of Instrumentation - generalized configuration - Tribo electric pick-up, Infrared Transducers - Torque measurement Elastic transducers - sound level meter - vibration measurements. Control System Components: Basics of control system – Control system examples - Stepper motors - Hydraulic valves - Pneumatic switches, proximity switches and flapper valves - Hydraulic and Pneumatic automation in textile machines- simple sequential logic circuit design - Programmable Logic Controllers (PLC), Block diagram – programming methods – programs – applications of PLC in textile machinery.

INDUSTRIAL AUTOMATION 9 Hrs

Industrial Automation: Introduction, integration, material handling system, simple systems for motions by electrical and mechanical devices- Mechanical design for automatic feeding assembly and transfer lines. Electronic Textile Instruments: Electronic principles in evenness tester, classification of faults, digital fibrograph, hairiness meter, Vibroscope - thickness measuring instruments, HVI, AFIS,Universal tensile testers.


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CONTROL SYSTEM & AUTOMATION IN SPINNING INDUSTRY **9 Hrs**

Control System and Automation in Spinning Machinery: Machinery material flow and its variation controls – Feeders and Stop motions – Auto levelers – safety switches. Production and quality monitors – Full doff and pre-set length monitors. Data acquisition system for spinning preparatory, ring spinning and rotor spinning. On-line monitoring system, case studies.

CONTROL SYSTEM & AUTOMATION IN WEAVING INDUSTRY **9 Hrs**

Control System and Automation in Weaving Machinery: Yarn clearer controls - knotter /splicer carriage controls - pre-set length/full cone monitors. Warping machine monitors and controls - sizing machine monitors and controls - auto-reaching/drawing-in and knotting machine monitors and controls. Data acquisition system in weaving preparatory and weaving – humidification system.

COMPUTERISED PROCESSING IN TEXTILES **9 Hrs**

Computerised Processing: CAD/CAM/CIM in spinning, Weaving, Dyeing, Printing and Apparel production. Electronic Data Interchange and E-com, internet commerce, Business strategy in E-com, Application of E-com in textile industry – Robotics in textile industries.

Theory : 45 Hrs **Total: 45 Hrs**

REFERENCES

1. Vassiliadis S G, “Automation and the Textile Industry”, Eurotex, 1996.
2. Ormerod A, “Modern Development in Spinning and Weaving Machinery”, Butterworths, 1993.
3. Gordon A. Berkstresser III et.al, “Automation and Robotics in the Textile and Apparel Industries”, Noyers Publication Park Ridge, 1996.
4. Nalura B C, “Theory and Applications of Automatic Controls”, New Age International (P) Ltd Pub, 1998.
5. George stylios, “Textile objective measurement and automation in

garment manufacture", E.Horwood, 1991.
6. Berkstresser G A, Buchanan D R and Grady P, "Automation in the Textile Industry from Fibres to Apparel", The Textile Institute, UK, 1995.
7. "Textiles Go On-line", The Textile Institute, UK, 1996.

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P15TX*T*E13/ APPAREL PRODUCTION MANAGEMENT

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Compare the different production system used in apparel industry

CO2: Develop a layout for different styles of garments

CO3: Break down the operational sequence of different styles of garments.

CO4: Determine the manpower and machine for balanced production
CO5: Calculate the standard time different styles of garments

Pre-requisites:
1. Garment Manufacturing Technology
2. Industrial Engineering in Textile Industry

INTROCUCTION **9 Hrs**

Introduction-Objectives-Production management-Product design-Design of production system-Types of production system-Manufacturing process-Types of manufacturing process-Factors affecting the choice of manufacturing process-Production planning and control-Benefits to small entrepreneur-Steps of production planning and control- Planning & lead Time -Importance of pre-production activities.

PLANT LAYOUT AND PRODUCTION SYSTEMS **9 Hrs**

Definition of Plant Layout - Types of Production Layout – Product and Process layout - Planning a layout- Calculation of minimum transport distance -Determining minimum space requirement for the layout - Formulating a layout for different styles of garments Whole garment Production system – Group system-Unit flow system - Multiple flow and Progressive Bundle system –Synchro straight line system-Unit Production system-Quick response production system- Principles for choosing a Production system - Evaluation of production system.

OPERATION SEQUENCE DEVELOPMENT **9 Hrs**

Operation required in garment construction - Operation specifications – Operation Break down-Product Flow charts- Men's shirt-Trousers-Skirt-Shorts-Five pocket Jeans-T-Shirt; Flow Process grid-T-shirt-Preparation of Operation Bulletin-Work aids-attachments-Machinery specifications.

PRODUCTION SCHEDULING AND BALANCING **9 Hrs**

Production scheduling-Gantt chart preparation-Capacity calculation for cutting, sewing and finishing; determination of machine requirements for a new factory; Steps in line balancing: determination and allocation of manpower and machine for balanced production in existing plant for a given

target.

INDUSTRIAL ENGINEERING **9 Hrs**

Method Study and Work Measurement -Techniques - Principles of Motion Economy – Classification to Movements - Process Flow Chart – Two-handed Process Chart, Micro-motion Study - Time Study – Definition - Steps in making a Time Study - Breaking the Job into Elements - Stop Watch Procedure. Time Study Rating, Calculation of Standard Time.

Theory : 45 Hrs **Total: 45 Hrs**

References:

1. William K.Hodson, "Maynord's Industrial Engineering Handbook", IV edition, McGraw Hill Inc., New York, 1992.
2. Herold Carr and Barbara Lathem, " The Technology of Clothing Manufacturing", II nd Edition, Blackwell Scientific Publications, London, 1988.
3. Solinger Jacob, "Apparel Manufacturing Hand Book - Analysis, Principles and Practice", Columbia Boblin Media Corp., 1988.
4. David J.Tyler, "Materials Management in Clothing Production", 1991.

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P15TX*T*E14/ APPAREL QUALITY CONTROL AND STANDARD

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Explain different raw material inspection systems used in apparel industry

CO2: Discuss the quality control techniques in sewing department.

CO3: Describe the quality control techniques in pressing and packing department

CO4: Explain different statistical sampling methods used for final garment inspection

CO5: Compare different care labeling system

Pre-requisites:

1. Garment Manufacturing Technology
2. Textile Quality Evaluation

RAW MATERIALS INSPECTION AND QUALITY CONTROL IN CUTTING DEPARTMENT **9 Hrs**

Purchasing specifications - Testing and Inspection of raw materials - Point Systems – 4 Point system, 10 point system, Graniteville "78" system. Spreading properties of fabrics - Tension in Spreading of fabrics – Quality factors in cutting, Bundling and ticketing as related to quality.

QUALITY CONTROL IN SEWING DEPARTMENT **9 Hrs**

Stitching quality control- Stitch size, Stitch tension, Seam elasticity and elongation – Fabric distortions. Seam quality control- Seam size, Seam slippage and Seam strength- Fabric Sewability. Selection of stitches and seams for woven and knitted Apparels. Control of sewing, seaming and assembly defects. In process inspection in sewing.

QUALITY CONTROL IN PRESSING, PACKING AND FINISHED GARMENT **9 Hrs**

Quality requirements for pressing operation - Quality control in functional package for apparel- Merchandise package, Stock storage, Shipping package. Visual inspection and definition of defects and tolerance – Methods of measuring.

QUALITY CONTROL TOOLS AND STATISTICAL SAMPLING IN APPAREL MANUFACTURE UNIT: **9 Hrs**

Quality control tools- Flowcharts, Control charts, Cause and Effect diagrams, Pareto charts, Check sheets and scatter diagram. Statistical Sampling- Acceptable Sampling - Acceptable Quality level (AQL) - Single sampling - Double Sampling.

CARE LABELING OF APPAREL AND QUALITY ASSURANCE IN APPAREL INDUSTRY: **9 Hrs**

Care Labeling system- American Care labeling System, British Care Labeling System, International Care Labeling System, Canadian Care Labeling System, Japanese Care labeling System - Symbols and meanings. Introduction and purpose of ISO series - Sequence of activities in implementing ISO series in a garment manufacturing unit.

Theory : 45 Hrs **Total: 45 Hrs**

References:

1. Samuel K H, "Encyclopedia of Management - TQM Vo1 3, Crest Publishing House, 1999.
2. NMP Nambiar, "A guide on ISO 9000", Systems and Resources, 1994.
3. Metha P V and Bharadwaj S K, “Managing Quality in the Apparel Industry", New Age International (P) Limited, 1998.
4. MethaPradip V, "An Introduction to Quality Control for Apparel Industry", ASQC Quality Press, 1992.
5. SolingerJacob,"Apparel Manufacturing Hand book - Analysis, Principles and Practice", Von Nostrand Reinhold Limited, 1980.

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P15TX*T*E15/ TEXTILE COSTING & OPTIMISATION

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Classify cost of a product according to cost behavior.

CO2: Compare absorption costing with variable costing based on inventory and profit.

CO3: Estimate cost per unit in textile industry with different sizes.

CO4: Explain the general principles to be kept in mind while considering whether the item of expenditure to be treated as overhead.

CO5: Discuss on various cost control measures and their significance on the pricing of a textile product in the textile industry.

Pre-requisites:

1. Yarn Manufacturing Technology I & II
2. Woven fabric manufacturing technology
4. Knitting Technology
5. Garment manufacturing Technology
6. Statistical application in Textile Engineering

INTRODUCTION **9 Hrs**

An Introduction to cost terms and purposes - cost terminology - direct and indirect costs. Cost behavior patterns: variable costs - fixed costs - total costs - unit costs. Financial statements and inventory costs - types of inventory - production costs - prime costs - conversion costs. Costing for manufacturing,

merchandising and service sector companies.

ACTIVITY BASED COSTING AND MANAGEMENT 9 Hrs

Activity based costing and management - broad averaging via smooth or peanut- butter costing approaches - refining a cost system - costing hierarchies - comparison of alternate costing systems - ABC system for cost management and profitability improvement - Activity based costing and department costing systems

COST ANALYSIS 9 Hrs

Cost application and revenues - purpose of cost allocation - allocating cost from one department to another and support departments. Cost allocation of joint products and by products. Cost Volume Profit analysis – assumption – terminology - essentials of CVP analysis - the breakeven point. Target operative income and income taxes – service and non-profit organizations - effect of sales mix on income.

OPTIMIZATION OF COSTING 9 Hrs

Process costing - hybrid costing systems - operation costing - journal entries - spoilage rework and scrap costing - quality, time and theory of constraints. Control charts - Pareto diagrams, cause and effect diagrams. Inventory management - Just in Time (JIT) and back flush.

COSTING TOOLS & DECISION MAKING 9 Hrs

Inventory costing and capacity analysis - standard costs - cost estimation approaches. Tools for planning and control - master budget and flexible budgets - Use of variances - flexible budget variances and sales volume variance - primary variance and efficiency for direct cost input - planning variable and fixed over head costs. Decision marketing and retrieving information - pricing decisions and cost management - target costs.

Theory : 45 Hrs Total: 45 Hrs

References:

1. Kalyanaraman.A.R. “Energy Conservation in Textile Industries”,

SITRA, 2002.
2. V.Dudeja “Textile Industry Management” (ATIRA), 2000.
3. Modern production Technologies edited by M.L.Gulrajani, The Textile Association (India)
   Publications, 2004
4. James.C. Van Home – “Financial management & Policy”, Prentice hall of India (p) Ltd., NewDelhi (2002)
5. Larry M. Walther & Christopher J.Shewen, “Managerial & cost accounting” ventus publishing April, 2009 – ISBN: 978-87-7681-491-5
6. Cost control and costing in spinning mills – SITRA, Edition 2008.
7. Cost control and accounting for Textile industry – TAIRO, Edition 2006.

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P15TX*T*E16/ MANAGEMENT OF RESEARCH AND DEVELOPMENT

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Explain the technological innovation in R&D activity

CO2: Identify the innovation in textile organization

CO3: Manage R&D activities in organizations

CO4: Clarify the intellectual property rights

CO5: Describe the procedure of patent

Pre-requisites: Nil

TECHNOLOGICAL INNOVATION 6 Hrs

Technological Innovation- types, nature, processes, need and importance; R&D - in world economic development, Indian economic development; R&D - corporate function and forstrategic partnership in industries; innovation and creativity.

INNOVATION IN TEXTILE ORGANIZATION 9 Hrs

Innovation focus in textiles organisations; HRM issues in textile innovations, leadership and innovation management in textile industries; organizational design and structure in textile innovation management; measurement, evaluation and assessment of R&D.

R&D WORK PROCESS 9 Hrs

Indian R&D infrastructure and Institutional framework; R&D promotion, incentives and support, cooperation between industry, institution and government Departments; commercialization of R &D; financing of R&D projects.

INTELLECTUAL PROPERTY RIGHTS 9 Hrs

Concept of intellectual property, different types of IP, rationale behind intellectual property, balancing the rights of the owner of IP and society, enforcement of IPR; IP and constitution of India, world intellectual property organization (WIPO), WTO/TRIPS agreement, India and the TRIPS agreement; Patent law in India, interpretations and implementations, transitional period.

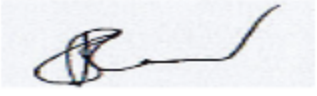
PATENTS **12 Hrs**

International patent laws, the patent cooperation treaty; Madrid system of international registration of trade marks, Hague system of international protection of industrial designs, The Lisbon agreement of protection of appellations of origin; Indian patent system, patentable inventions, difference between patentable and non patentable inventions; procedure for obtaining patent, consequences of grant of patent, rights of a patentee, limitations on patentee's rights, revocation of patent for non-working; transfer of patent, licence, transmission of right by operation of law, infringement of patent; Case studies relevant to textile patents.

Theory : 45 Hrs **Total: 45 Hrs**

References:

1. Alexander Stack, "International Patent Law", Edward Elgar Publishing Limited, 2011, ISBN: 9781849802581.
2. Allan Afuah, "Innovation Management, 2/e", Oxford University press India, 2009, ISBN:9780198064169.
3. Joe Tidd and John Bessant, "Managing Innovation: Integrating Technological, Marketing and Organizational Change", IV Edition, John Wiley India Pvt. Ltd New Delhi, 2011,ISBN 13:9788126534050.
4. Rao M.B. and Manjula Guru " Patent Law in India", Wolters Kluwer Law and Business, 2010,ISBN 13: 9789041132604
5. "Managing Innovation in Textiles 2011-International conference", Textile Institute, Manchester, UK, 2011, ISBN:9780956641922



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P15TX*T*E17/EXPORT DOCUMENTATION & GLOBAL MARKETING

Course Outcomes (COs):

After successful completion of this course, the students should be able to

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CO1: Explain export credit systems
CO2: Describe the functions of trade
CO3: Illustrate the credit and debit
CO4: Explain the export and import policy
CO5: Summarize the various documents in export

Pre-requisites: Nil

EXPORT CREDIT **9 Hrs**

Export credit -short term, anticipatory letter of credit, and packing of credit. Negotiation of bills, source of short-term credit, medium-term and long-term export credits, methods, roll of terms of payment in international marketing, Factors responsible for counter trade growth.

TRADE **9 Hrs**

Domestic trade Vs international trade, Regional trade blocks. Foreign exchange market –Nature of foreign exchange market, Main functions Business and environment –Social environment, Log ic al environment, Business ethics.

CREDIT & DEBIT **9 Hrs**

Balance of payment, deficit in balance of payment, debits & credits, foreign exchange market, commercial bank credit for export trade.

POLICY **9 Hrs**

Standard policies -Indian trade police, India's foreign trade policy, exports and imports policy.

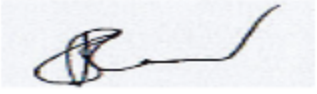
DOCUMENTS **9 Hrs**

Major documents for exports – International codes for products and services –principal documents, auxiliary documents, documents for claming export assistance.

Theory : 45 Hrs **Total: 45 Hrs**

References:

1. Jeannette Jamow, Kitty G.Dickerson, “Inside the Fashion Business”, Prentice Hall,
   1997.
2. Richard M.Hill, Ralph S.Alexander, James S.Cross, “Industrial Marketing”, Aitbs
   Publishers & Distributors, 1998.



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P15TX*TE*18/ MANAGEMENT OF TEXTILE PRODUCTION

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Explain the management technique

CO2: Describe the production planning and control

CO3: Describe the quality management system

CO4: Explain the functions of marketing management

CO5: Describe the role of enterprise resource planning

Pre-requisites: Nil

9 Hrs

INTRODUCTION

Indian Textile Industry: Structure, production and exports. Textile Policy. Sickness of Textile Industry- Analysis and options. Essentials of production management, production systems, classification. Material management: Role of material management techniques, purchase management, acceptance sampling and inspection, vendor rating system, inventory management.

PRODUCTION PLANNING & CONTROL **9 Hrs**

Production, planning and control: types of production systems and problems of planning and control, product section design, process planning, forecasting, planning of batch, mass and job shop system. Machine balancing. Layout and material handling. Machine assignment and allocation of jobs.

MAINTENANCE & QUALITY MANAGEMENT **9 Hrs**

Maintenance management: maintenance concepts, maintenance strategies, maintenance planning. Productivity and improvement techniques. Quality management: Introduction to TQM, concepts of value and quality assurance, total quality control, quality circles, ISO 9000.

MARKETING MANAGEMENT **9 Hrs**

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Marketing management: fundamental of industrial marketing, industrial buyer behaviour model. Marketing: systems selling, role of service, marketing planning and marketing strategies. Purchasing; Objectives, value engineering, vendor relations, selection of vendors. Material Requirement Planning: MRP Calculations, material handling. Job Evaluation: Incentive schemes, job redesign.

ENTERPRISE RESOURCE PLANNING **9 Hrs**

Enterprise resource planning: Role of information in managerial decision making, information needs for various levels of management, decision makers, management information system, resource monitoring and control. Product mix. Case studies.

Theory : 45 Hrs **Total: 45 Hrs**

References:

1. Websites and Publications of Research Associations and Iindustry Associations.
2. Handouts of HRD programmes conducted by Research Associations and Industry Associations.
3. http:// www. txcindia.com
4. http:// www.texmin.nic.in
5. Khanna O.P "Industrial Engineering & Management", DhanpatRai& sons, Delhi, 2004.
6. KiellB.Zandin, "Maynard's Industrial Engineering Hand Book", McGraw Hill, Inc., New York, 2001
7. Jain K C and Chitale A K, "Quality Assurance & Total Quality Management", Khanna Publishers, New Delhi, 2004.
8. Ormerod.A., "Textile Project Management", The Textile Institute, Manchester, New eidition, ISBN: 1870812387, 2002.
9. ILO, Geneva, "Introduction to Workstudy", Universal Publishing Corporation, Mumbai, 2006.

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ONE CREDIT COURSES
(Industry Based)


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P15TXIN01 LEAN MANUFACTURING FOR APPAREL INDUSTRY

L	T	P	C
1	0	0	1

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Explain the lean management concepts

CO2: Describe the production planning and control

LEAN MANUFACTURING CONCEPTS: MRP, JIT, FMEA, cellular manufacturing, work-in-process reduction, the Toyota system.

FINDING & ELIMINATION OF LOST TIME: Lost time definition, lost time causes, Delay-ratio analysis. Case studies.

TAKT TIME, CAPACITY & LOAD: Determination of takt time, capacity & load – case studies.

LEAN PRODUCTION FLOW: Identifying and elimination of unnecessary steps. Optimisation of process flow.Balancing the operation, wastages control.Case studies.

VISUAL MANUFACTURING: Definition, shop floor practices, 5S program. Case studies.

THE SIX SIGMA APPROACH: Definition, Six sigma statistical methods, variability reductions. Case studies.

Total L:15

REFERENCES:

1**.** Askin R.G and Goldberg J.B, "Design and Analysis of lean production systems", John willey& Sons Inc, New York, 2003.

2. William M.Feld, "Lean Manufacturing: Tools, Techniques and How to Use Them", St.Lucie Press, London, 2001.

3. Colovic.G. "Management of technology systems in garment industry" Woodhead Publishing India Pvt Ltd, New Delhi, 2010.

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4. Chuter A.J, “Introduction to clothing production management”, Blackwell publishing, USA, 2004.
5. Solinger Jacob, “Apparel manufacturing handbook – Analysis, principles & practice”, Boblin media
corporation, Columbia, 2000.
6. Ruth E Glock, Grace I Kunz, “Apparel manufacturing – Sewn production Analysis”, Prentice hall Inc, New Delhi, 2000.
7. Michael L George, David T Rowlands, Bill castle, “What is lean six sigma”, McGraw-Hill, New York, 2004.

P15TXIN02 **SPECIALITY FABRIC STRUCTURES**

L	T	P	C
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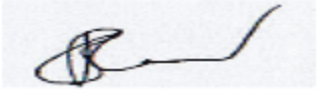
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Course Outcomes (COs):
After successful completion of this course, the students should be able to
CO1: Explain the speciality fabric structure
CO2: Describe the application of speciality fabric

WOVEN FABRICS: Simple structure, compound structure, figured piques – fast back piques. Multi- layer fabrics – introduction of treble cloth.Introduction to triaxial structure.Madras muslin structures. Pile fabrics – weft plush, carpet pile structures – axminster carpet structures.

WEFT KNITTED FABRICS: Introduction to blister jacquard fabrics, plated structures. Fleecy fabrics – classification – plush structures Introduction to spacer fabric.

WARP KNITTED FABRICS: Directionally oriented structures – weft insertion, co-we-knit. String vests, crepe fabrics, plush fabrics, waffle fabrics, spacer fabrics.

Total L:15

REFERENCES
1. Grosicki Z J, "Watson's Advanced Texted Design", Universal Book Stall, 1989.
2. Grosicki Z J, "Watsons Textile Design and Colour", Butterworths, London 2003. 66

P15TXIN03 DENIM FABRICS AND GARMENTS

L	T	P	C
1	0	0	1

Course Outcomes (COs):
After successful completion of this course, the students should be able to
CO1: Explain the manufacturing of denim fabric
CO2: Describe the production planning and control

Yarn Requirements and Characteristics for Denim – Weaving of Denim Fabrics – Physical properties of denim fabrics. Dyeing of Warp Yarn – Indigo dyeing – Indigo & Sulphur dye combinations. Garments: Design and construction – production process of denim garments. Finishing of Denim fabrics and Garments – Stone and Stoneless Washing of Denim Garments.
Bleaching of Denim Garments using Oxidative and Enzyme Treatments – Backstaining of Garments and Remedies.

Total L:15

REFERENCES

1.M. S. Parmar, S. S. Satsanji and Jai Prakash,Denim – A Fabric for All , NITRA Publications,
1996.
2. J. V. Rao, Denim Washing, Northern India Textile Research Association, Ghaziabad, 2006.

P15TXIN04 AUTOMOTIVE TEXTILES

L	T	P	C
1	0	0	1

Course Outcomes (COs):

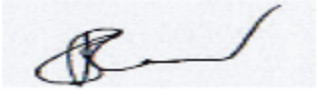
After successful completion of this course, the students should be able to
CO1: Explain the usage of textile product in automotive application
CO2: Describe the application of textile in automobile accessories

Overview – History – Material Survey for automotive textiles: Fibres – yarns – fabrics – methods of processing. Interior Trim – Design of seats – materials for seat construction – seat comfort. Headliners – Door casings – Parcel shelves – sun visors – boot linings. Automobile accessories – Seat belts – airbags – carpets – cabin air filters – battery separators – hood liners – wheel arch liners – Tyres – hoses – belts Textiles in other forms of Transportation – tarpaulins – bus interiors – Railroad – marine – sails and ropes – aircraft Future Outlook –New developments and opportunities – Environmental issues – Visions of the future – fabric design aspects.

Total L:15

REFERENCES

1. Fung Walter and Michael Hardcastle, Textiles in Automotive Engineering Woodhead Publishing Limited, England, 2001.
2.S. Adanur (ed.), Wellington, Sears Handbook of Industrial Textiles , New York, Technomic, 1995.
3. S. K. Mukhopadhyay and J. F. Partridge, Automotive Textiles', Textile Progress 29, (1/2)
Manchester, The Textile Institute, 1999.
4. M. Ravnitzky (ed.), Automotive Textile', PT-51, Warrendale, PA, USA, SAE, 1995.
5. Textiles and Surfacing Materials (Plastics in Automotive Engineering) , Congress Papers, March 1998, Mannheim, VDI Dusseldorf, 1998.
6. C. W. Evans, Hose Technology, London, Applied Science Publishers, 1979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P15TXIN05	ERECTION AND COMMISSIONING OF TEXTILE MACHINES	L	T	P	C
		1	0	0	1

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Explain the erection procedure for textile machines

CO2: Describe the commissioning of textile machines

Floor levelling using U tube water level – Machine case handling while shifting machines – packing list and physical stock verification – arranging components for erection – storing sensitive and expensive components – work table arrangement – special tools – provisions for power and pneumatic lines – manpower: skilled and un-skilled manpower requirement – machine

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layout line marking – positioning the base machine – machine levelling – erection sequence – erection schedule – trial run – commissioning procedure – training to operators & maintenance personnel – reports and sign off.

Total L:15

REFERENCES

1.LMW erection manuals and handouts

P15TXIN06 EXPORT DOCUMENTATION

L	T	P	C
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Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Explain the documental procedure for export

CO2: Describe the types of export document

Export credit – Short term – Medium term – Long term – Anticipatory letter of credit – Packing Credit – Negotiation of bills – Terms of payment in international marketing. Export Documents: International codes for products and services – Principal documents – Auxiliary documents – Documents for claiming export assistance.

Total L:15

REFERENCES

1. V. R. Sampath, R. Perumalraj and M. Vijayan, Apparel Marketing and Merchandising,

KalaiselvamPathippakam, Coimbatore, 2007

P15TXIN07 QUALITY IMPROVEMENT PROGRAM IN HOME TEXTILE INDUSTRY

L	T	P	C	
1	**0**	**0**	**1**	

Course Outcomes (COs):

After successful completion of this course, the students should be able to

CO1: Explain the statistical tool for apparel quality improvement

CO2: Describe the concept of inspection and TQM system in home textile

STATISTICAL TECHNIQUES FOR APPAREL QUALITY IMPROVEMENT- Statistics Definition, Data collection and analysis, Reminder for data collection- Tools of Statistical Techniques- Check sheet, Bar chart, Pareto chart, Cause and effect diagram, Brain Storming, Paired Comparison, Quality Control charts- p-Chart, np-Chart

VISUAL INSPECTION OF HOME TEXTILES- Visual Inspection of Fabrics- Fabric Defects- Flaw Grading System-4-Point System,10-Point System- Visual Inspection of Made-ups- Fabrication Defects-100%

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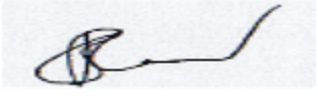
Inspection, Sampling Inspection- MIL STD 105E- AQL- Single Sampling plan, Double Sampling Plan

TOTAL QUALITY MANAGEMENT SYSTEM- Quality Control, Quality Assurance, Quality Management System, TQM

Total L:15

REFERENCES

1. Cargill, Katrin, "Home Furnishing Workbook: Featuring 32 Step-by-step TextileFurnishing Projects", Rayland Peters and Small, USA, 2001.
2. Whitemore Maureen, "The Home Furnishings Workbook", Randall InternationalNovember, 1999.
3. Statistical Technique in Textile mills SITRA- Year 2006
4. Practical Statistics for the Textile Industry Part-I, II GAV- leaf – 1984/ Textile Institute England
5. Textile Processes – quality Control and design of Experiments;-Georgi Damyanov and Diana Germanova – Krasteva / Momentum Press Newyork – 2013.



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