

**DEPARTMENT OF TEXTILE TECHNOLOGY**  
**SGGS INSTITUTE OF ENGINEERING & TECHNOLOGY VISHNUPURI, NANDED**  
**CURRICULUM OF M. Tech. (TEXTILE TECHNOLOGY)**  
**For 2016-17 Admission**

<b>Semester I</b>				
<b>Code No.</b>	<b>Sr. No.</b>	<b>Title of the Course</b>	<b>Credits</b>	<b>Lecture-Tutorial-Practical/Week</b>
TTT 501	1	Advanced yarn production	03	(3-0-0)
TTT 502	2	Research methodology & statistical analysis	03	(3-0-0)
	3	Electives (Choose any two)		
TTT 511		i. Technical textile	03	(3-0-0)
TTT 512		ii. Industrial engineering & management	03	(3-0-0)
TTT 513		iii. Knitting & nonwovens	03	(3-0-0)
TTT 514		iv. Structure & mechanical properties of Textiles	03	(3-0-0)
TTT 515		v. Melt spinning & texturising	03	(3-0-0)
TTT 503	4	Industry Laboratory Practice I	03	(0-0-6)
TTT 504	5	Seminar I	02	(0-0-2)
TTT 505	6	Case study I	03	(0-0-6)
		Sub Total	20	(12-0-14)
<b>Semester II</b>				
TTT 521	1	Modern Weaving Technology	03	(3-0-0)
TTT 522	2	Project Management & Finance	03	(3-0-0)
	3	Elective II (Choose any two)		
TTT 531		i. Geotextile & Engineering	03	(3-0-0)
TTT 532		ii. Advanced textile wet processing	03	(3-0-0)
TTT 533		iii. Garment technology & merchandising		(3-0-0)
TTT 534		iv. Advanced Textile Testing	03	(3-0-0)
TTT 535		v. Textile Composites	03	(3-0-0)
TTT 523	4	Industry Laboratory Practice II	03	(0-0-6)
TTT 524	5	Seminar II	02	(0-0-2)
TTT 525	6	Case study II	03	(0-0-6)
		Sub Total	20	(12-0-14)
<b>Semester III</b>				
TTT 541	1	Dissertation Part I	16	(0-0-16)
TTT 542	2	Seminar III	02	(0-0-2)
TTT 543	3	Comprehensive Viva	02	(0-2-0)
		Sub total	20	(0-2-18)
<b>Semester IV</b>				
TTT 551	1	Dissertation Part - II	20	(0-0-20)
		Total (Sem I,II,III,IV)	80	(24-2-66)

# SEMESTER I

## TTT 501: Advanced in Yarn Production

(L3-T0-P0): 3 Credits

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**Spinning Preparations:** Fibre mixing and blending practices in industry, Bale Management, Blending Performance Evaluation – Degree of Mixing, Index of Blend Irregularity, Hamburger model- yarn tenacity prediction from fibre properties, Evaluation of blow room performances and AFIS applications

Fibre separation in carding, Design and actions of wire points in carding, Transfer efficiency in carding, Roller drafting, Irregularity in textile strands, Limit irregularity, Index of irregularity, Causes of generation of irregularities, Hook removal in drawframe, Autolevellers in carding/drawframe, Details of combing preparation, Process parameters in speedframe and roving quality

**Ringframe:** Twisting and winding process in ring spinning, Yarn tension in spinning balloon and its effect on yarn quality, Mass variation in ring spun yarns- basics, causes, measurements and detections

**Rotor Spinning:** Productivity- Charka, Ring and Rotor spinning, Fibre properties and yarn quality, Yarn tension in rotor spinning, Process and machine parameters and yarn properties

**Air-Jet Spinning:** Twisting and yarn formation, Process and machine parameters and yarn properties, Yarn structure and properties

**Friction Spinning:** Mechanism of yarn formation, Production of multi-layer and multi-component yarns by friction spinning, Yarn structure and property relation

### References Books:

1. Spinning of Manmades and Blends on Cotton System, **K. R. Salhotra**
2. Textile Mathematics, Vol.-2 (The Textile Institute), J. E. Booth
3. The Technology of Short Staple Spinning, (Short Staple Spinning Series, Vol.-I), **W. Klein**
4. A Practical Guide to Opening and Carding, (Short Staple Spinning Series, Vol.-II), **W. Klein**
5. A Practical Guide to Combing and Drawing, Vol.-3 (The Textile Institute), W. Klein
6. A Practical Guide to Ring Spinning, Vol.-4 (The Textile Institute), W. Klein
7. New Spinning Systems, Vol.-5 (The Textile Institute), W. Klein
8. Fundamentals of Spun Yarn Technology (CRC Press), Carl A. Lawrence
9. The Principles and Theory of Ring Spinning, Vol.-V (The textile Institute), A. E. De Barr and H. Catling
10. Open-end Spinning (Elsevier Science), V. Rohlena
11. Rotor Spinning- Technical and Economic Aspects (Textile Trade Press, The Textile Institute), E. Dyson
12. Rotor Spinning (The Textile Institute, Manchester), C. A. Lawrence and K. Z. Chen

## **TTT 502: Research Methodology & Statistical analysis,**

**(L3-T0-P0): 3 Credits**

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**Part 1:** Introduction, overview of research methodology, criteria of good research, motivation in research, types of research, research methods vs methodology, literature survey, defining the research problem, research design, sampling design, measurement & scaling techniques, methods of data collection and presentation, preparation and presentation of research proposal, interpretation & report writing.

**Part 2:** Processing & analysis of data, statistics in research, measures of central tendency, dispersion, regression analysis, sampling fundamentals, defining & testing of hypotheses, analysis of variance

**Part 3:** Role of computer in research, study of software such SPSS, DEA, Design of experiment, & STATA etc., LATEX-DTP for thesis writing, research funding & e-resources, writing of good research papers.

### **References book:**

1. Research methodology: methods & techniques- C R Kothari, New age international publishers
2. Practical statistics for the Textile industry Part I & II- GAV Leaf, The Textile institute
3. Basic econometrics: Damodar N Gujarati, TATA Mc GRAW Hill

## **ELECTIVES**

### **TTT 511: Technical Textile**

**(L3-T0-P0): 3 Credit**

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Introduction, types of technical yarn, yarn characteristics: monofilament, multifilament, intermingled yarn, tape yarn, core spun yarn-Non elastic core and elastic core, plied/ folded yarn, cabled yarn, braided yarn.

Tape yarn production technique, fibrillated tape yarns. Filament wrapped yarns..

Properties and performance of technical yarns.

Textile Coating & Laminating: Coating materials, coating polymers such as PVC, PVDC, PU,PTFE, Acrylic polymers, rubber and its derivatives, EVA, CARBON NANO TUBES.

Principles of coating, aqueous coating, hot melting coating, metal coating, plaiting, plasma treatment. Different methods of coating.

Novel technical textile yarns: Introduction, reflective yarns, classification, manufacturing process.

UV protected yarn, preparation of UV protection yarn, metallic and metalloplastic yarns, manufacturing techniques. Antimicrobial yarns, treatments, durable antimicrobial fibre/yarn. Yarns for specific purpose. Anti static yarn, anti stress yarn, anti allergic yarn, soluble yarn.

Electro conductive yarns, manufacturing process, Measurements, EMSE, applications  
High modulus yarns such as Glass, Carbon, Ceramic, Basalt fibers, HPPE fibres, their properties and uses.

Shape memory polymer yarns, manufacturing process, applications.

Plasma treated yarns for biomedical applications. Chemistry of plasma processing.

Industrial sewing threads, structure of sewing threads, thread finishing, yarn numbering. Threads for very high temperature.

Surgical threads, classifications, manufacturing process, characterization

### ***References Books:***

1. A. R. Horrocks & S. C. Anand, Handbook of technical textiles, The Textile Institute, Wood Head Publication Ltd., 2007
2. R. Alagiruswami and A. Das, Technical Textile yarns, The Textile Institute, Wood Head Publication Ltd., 2010
3. Wellington Sears Handbook of Industrial Textiles by Sabit Adanur, Technomic Publishing Co. INC, Lancaster, Basel, 1995
4. High performance fibres by P. Bajaj and A. K. Sengupta, The Textile Institute
5. Industrial Applications of Textiles: Textiles for Filtration and Coated Fabrics, P. Bajaj and A. K. Sengupta, The Textile Institute, Textile Progress, Vol 14, No.1

### **TTT 512: Industrial Engineering and Management (L3-T0-P0): 3 Credits**

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**Introduction to Work Study:** Definition: Purpose of study, objectives, brief history and evolution, work study and productivity, human factor in application of work study, scope, applications, relationship, between Productivity & standard of living, basic work content, excess work content Management, techniques to reduce excess work content due to product process and ineffective time in control of workers and Management.

**Ergonomics:** Introduction, Principles, Work system design, Man-machine system, Human behaviour and equipment design, Tools, Techniques and applications, Effect of environment on performance of worker, working conditions, prevention accidents and hazards, lighting, ventilation etc.

**Method Study:** Definition, Concept, Objectives and Procedure of method study, Flow and handling of materials; Process chart symbols, recording techniques like Flow process charts, Operation, Flow and Two handed Process charts, Flow diagram, String diagram, Multiple

Activity chart, travel chart, Operation Analysis, Analysis of motion, analysis and critical examination of existing methods and development of improved methods, Motion economy, Design of work place layout, Therbligs, SIMO chart.

**Work Measurement:** Definition, significance of work measurement; origin, development and procedure of work measurement, introduction to various work measurement techniques.

Time Study and Other Works Measurement Techniques: Time study: definition, equipment for basic time study, time study forms and other equipment. Steps in use of techniques of time study; selecting the job, breaking the job into elements, approach to the worker, the elements, timing each element, Maynard Operation Sequencing Technique (MOST), Average and qualified worker, rating procedures, criteria affecting the choice of rating procedures, criteria affecting the choice of rating procedures, continuous timing, fly back timing, accumulative timing; standard ratings, comparison of observed and standard ratings, factors affecting the rate of working, scales of rating, rating factors, recording the rating, summarizing the study, allowances, calculation and application of allowances.

Work sampling and production studies; General study of standard data & PTS.

**Quality management:**

Quality as a Corporate Strategy, What is Quality?, New Quality Concepts, Quality Circles, Kaizen, Contributions of Quality Management scientists- Dr. Deming, Crosby, Dr. Armond V. Feigenbaum, Dr. Ishikawa- Seven tools of quality management. Total Quality Management, Roadmap for TQM, Implementation of TQM, Six Sigma, Five 'S' , TIMWOOD 7-Seven Wastes, ERP etc.

Term Work: Minimum Four assignments based on the above syllabus.

**Reference Books:**

1. Introduction to work study - ILO
2. Motion & Time study Design & Measurement of Work - Ralph Barnes (Wiley Eastern).
3. Work Study - R.M. Currie & J.Faraday. (ELBS Pitman).
4. Hand Book of Industrial Engineering - Irson& Grant.
5. Productivity management - Concepts & Techniques- S.C.Sawhney.
6. Production and Operations Management – IInd Edition by S. N. Chary, published by Tata McGraw Hill
7. Testing and quality management by DR. V. K. Kothari

## **TT 513 : Knitting and Nonwovens**

**(L3-T0-P0): 3 Credits**

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Knitting basics, weft & warp knitting elements & loop formation, machines related to weft & warp knitting, advanced weft & warp knitted structures, quality aspects, mechanics of loop formation in weft & warp knitting, calculations related to knitting.

Non-woven fabrics, classification & applications, raw materials, manufacturing processes for non woven bonded fabrics, finishing of nonwoven bonded fabrics, Process variables & their effect on properties of non-woven fabrics, uses of nonwovens, testing methods of raw materials & fabrics.

### **Reference Books:**

1. Fundamentals & advances in Knitting Technology- S C Ray, WPI
2. Knitting: <http://nptel.ac.in/courses/116102008/>
3. Knitting Technology by David J. Spencer, WPI
4. Knitting Technology by D.B. Ajgoankar, Universal Publishing Corporation, Mumbai.
5. Nonwovens: <http://nptel.ac.in/courses/116102014/>
6. Needle Punching by A.T. Purdy, The Textile Institute, Manchester
7. Non-woven Bonded Fabrics by J. Lunenschloss, Ellis HORWOOD Limited
8. Handbook of non-wovens by S.J.Russel, The Textle Institute, Woodhead Publishing Ltd, 2007.

## **TTT 514 : Structural and mechanical properties of textiles**

**(L3-T0-P0): 3 Credits**

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Mechanism of deformation in fibers, Principles of elasticity & visco elasticity, Stress-strain relations, Creep, Stress-relaxation, Time-temperature effects, Dynamic mechanical properties, Model theory of visco-elasticity, Thermodynamic analysis of mechanical deformation & rubber elasticity, fibre friction optical properties of fibers, Refractive index & birefringence.

X-ray diffraction, Electron microscopy, IR spectroscopy, Scanning electron microscopy & study of fine structure, Surface structure of different textile fibres.

**TTT 515 : Melt spinning & texturising**  
**(L3-T0-P0): 3 Credits**

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Introduction, melt spinning concepts of polyester, polypropylene, Nylon, spinning of LOY, POY, FDY, BCF

Flow chart & various components of a melt spinning line, functions and design of the extruder, manifold, dynamic mixer, spinning beam, metering pump, melt filters, spinning pack, spinneret, types, design & role of quench chamber, spin finish applicator, winder, dryer, spin finish pump, intermingling device, Drawing & heat setting.

Raw material, types of chips, storage & conveying of chips, Chips properties, dew point, melt spinning line parameters & their controls, quench air parameters, winding parameters & calculations, testing & properties of raw materials & filament yarn, packaging of spools, norms for gradation, problems & remedial action during process, burn-out section, spin finish oil preparation, auto control systems, oil heating systems, Air treatment plant

Procedure for starting up of line, mounting & removal of spinning pumps, spin packs,

Post spinning processes: texturising, types, basic principles of draw & air jet texturising, yarn processing on texturising machine, processing parameters, yarn properties, problems & remedial actions during texturising, comparative study of texturising machines, modern developments, texturising for fancy yarn production. Modern developments in twisting & rewinding .

**Reference book:**

1. Manufactured fibre technology, V B Gupta & V K Kothari, Chapman & Hall
2. <http://nptel.ac.in/courses/>
3. Winter School on Manmade Fibres Vol-1; Edited By Gupta & Kothari; 1988,IITD
4. Winter School on Manmade Fibres Vol-II; Edited By Gupta & Kothari;
5. 1988,IITD Man-made fibres - Moncrieff.
6. Production of Synthetic Fibers by A. A. Vaidya, 1<sup>st</sup> Edition, published by Prentice Hall of India, New Delhi, 1988
7. Yarn Texturing Technology by J. W. S. Hearle, L. Hollick and D. K. Wilson; Textile Institute, WoodHead Publishing House, U. K.
8. A Guide to Crimping/Texturising Technology by MANTRA, Surat

**TTT 503 : Industry Laboratory Practice I**  
**(L--T—P 06): 03 Credits**

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Students can choose interested area in the field of fiber, yarn, fabric and garment technology. Students have to select any industry, related to area of their convenience. The syllabus of practical's shall be formed in consultation with subject co-coordinator & industry expert and finally take the approval from the department. Student should perform all practical's in the industry. At the end of the semester, they have to submit the report, attendance and industry certificate. Internal and external evaluation will be done as per the rules.

**TT 504 : Seminar - I**  
**(L--T—P 02): 02 Credits**

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Seminar-I should be based on the literature survey on any topic relevant to textile technology. Each student has to prepare a write up of about 20 pages of “A4” size sheets and submit it in duplicate as the term work. The student has to deliver a seminar talk in front of the faculty members of the department during mid semester & end term. The faculty members based on the quality of the work and preparation and understanding of the candidate, shall do an assessment of the seminar internally – jointly.

**TT 505 : Case Study – I**  
**(L--T--P06): 03 Credits**

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Case Study – I should be based on the topics relevant to textile technology in the field of fiber, yarn, fabric, garment technology and management related to area of their convenience. Product development, trouble suiting problems, best practices of the organization can be studied as a case study. The case study shall be framed in consultation with subject co-coordinator & industry expert and finally take the approval from the department. Each student has to prepare a write up 25-30 pages on “A4” size sheets and submit it in duplicate as the term work. The faculty members based on the quality of the work and preparation and understanding of the candidate, shall do an assessment of the case study internally – jointly.



## SEMESTER II

### TTT 521 : Modern Weaving Technology

(L3-T0-P0): 3 Credit

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Need of modern developments in weaving and its benefits

#### **Modern developments in Winding:**

**Introduction:** Yarn count monitoring, online classification of yarn defects, classification of foreign fibres. Joining of yarns, splicing: Pneumatic splicing, Electrostatic splicing, Mechanical splicing. Precision winder, auto speed control, automation, spindle identification, waste control, environment controls.

Uniform build of yarn package: Theory & practice. Effect of winding faults on H.S. warping and weaving.

#### **Modern Warping and Sizing:**

Concept of modern warping, developments in creel, head stock and different control systems.

Concept of modern sizing, developments in sow box, driving of cylinders and head stock, Development in sizing ingredients and different control systems.

#### **Modern Looms:**

Suitability of H.S. weaving machines. Technical aspects, economic aspects, manufacturer and machine related criteria, growth of technology, economics.

#### **Air-Jet Looms:**

Principles of weft insertion, weft tensioning, weft length measurement, sley movement, take-up motion. Equation of motion for weft yarn. Air-jet velocity profile, main nozzle, air guides, relay nozzle, weft travel position in air-jet, energy requirements. Method of operation of main jet. The air stream in the main nozzle area and its action on the weft thread.

Improvement jet system. Study on pneumatic weft insertion behaviour in main nozzle. Interaction between air, yarn and guide system to increase the yarn velocity. Advancement of Air-jet looms. Range of applications.

#### **Rapier weaving:**

Recent developments, development in filling insertion, picking speed, secure filling transfer, and versatility of Rapier of Rapier gripper. Free flight rapier, light rapier head, electronic filling

tension controller, pre winder switch-off monitoring, filling detection at the end of insertion, pick finding, rapier cleaning devices.

Electronic controls, developments in let-off mechanism and take-up mechanism, selvages. Efficiency of rapier loom.

### **Gripper Projectile Loom:**

Ballistic weft insertion, velocity and acceleration of projectile, work done in picking. Different kinds of projectiles uses, colour change at thread transfer. Some features of modern Sulzer looms. PU & PS series machines, Sulzer P7100. Economics of projectile weaving machine. Range of applications.

### **Techno Economics of High Speed weaving:**

Introduction, parameters needed for techno economics analysis. Selection of weaving machines. Cost-width relationship, colour & weft mixing, noise level, yarn quality, floor & building. Economic analysis. Capital cost, accommodation cost, spare parts cost, energy cost, accommodation costs, and conclusion.

### **The position of cloth fell under stable weaving conditions:**

The function of take-up motion, the physical aspect of the cloth fell equation, the relation between beat-up force & pick spacing( the inverse distance equation). Bumping conditions, cloth fell equation under bumping condition.

### **Reference Books:**

1. Principles of Weaving- Mark & Robinson.
2. Shuttleless Wvg.Machines- OldrichTalavasek and Vladimir Svaty.
3. Weaving machines, mechanisms management – M.K.Talukdar,
4. High speed weaving-K.Jaychandran at all-PSG College of Technology, Coimbatore
5. SIZING-Materials, Methods, Machines- Ajgaonkar, Talukdar and Wadekar

### **TTT 522 : Project Management and Finance (L3-T0-P0): 3 Credit**

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Introduction, Project Management principles, Project Management definition, Project Management perspective, Organisational Structure and Organisational Issues: Introduction, Concept of Organisational Structure, Roles and Responsibilities of Project Leader, Relationship between Project Manager and Line Manager, Leadership Styles for Project Managers, Conflict Resolution, Team Management and Diversity Management, Change management

Project stake holder definition, Project sponsor and Project manager definitions, Project life cycle definition, functional areas of Project Management.

Project Identification and Selection: Introduction, Project Identification Process, Project Initiation, Pre-Feasibility Study, Feasibility Studies, Project Break-even point,

PERT and CPM: Introduction, Development of Project Network, Time Estimation, Determination of the Critical Path, PERT Model, Measures of variability, CPM Model, Network Cost System

Project Management Information System: Introduction, Project Management Information System (PMIS), Planning of PMIS, Design of PMIS, Project Management Software: Introduction, Advantages of Using Project Management Software, Common Features Available In Most of the Project Management Software, Illustration

Financial Management: Introduction, Meanings and Definitions, Goals of Financial Management, Finance Functions, Interface between Finance and Other Business Functions,

Financial Planning: Introduction, Objectives, Benefits, Guidelines, Steps in Financial Planning, Factors Affecting Financial Planning, Estimation of Financial Requirements of a Firm. Means of finance, Funding agencies, Venture capital.

Capitalisation Time Value of Money: Introduction, Rationale, Future Value, Present Value, Valuation of Bonds and Shares: Introduction, intrinsic value, book value, Valuation of Bonds, Valuation of Shares Cost of Capital: Introduction, Meaning of Cost of Capital, Cost of Different Sources of Finance.

### **References:**

Principles of project management- project skills, Paul Newton, ISBN 978-1-62620-950-9.

Project Management: A Managerial Approach, Jack Meredith and Samuel

Project Management: A Systems Approach to Planning, Scheduling, and Controlling, Harold Kerzner, Ph.D. Mantel Jr, 6th ed. Wiley.

Project Management for Business and technology: Principles and Practice, John M. Nicholas, Pearson Prentice Hall, New Delhi, 2005.

Project Management-Case Studies, Harold Kerzner, John Wiley & Sons, New Jersey, 2006.

Project and Production Management, A course by

National Programme on Technology Enhanced Learning (NPTEL), Arun Kanda and S. G. Deshmukh, IIT Delhi, 2005.

Projects: Preparation, Appraisal, Budgeting and Implementation, Prasanna Chandra, Tata McGraw Hill Publishing Company Ltd., New Delhi, 1980.

Financial Management by I. M. Pandey, published by Vikas Publishing, New Delhi

Cost Accounting by Arora

Cost Accounting: A Managerial Emphasis by Charles T. Horngren, Datar, G. Foster, M. V. Rajan and C. Ittner

## Electives II

### **TTT 531: Geo-textile & Engineering: (L3-T0-P0): 3 Credit**

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**Engineering with Geo-textiles :** Soil it's three phase system, Definition and relationship different soil parameters like Density, Specific gravity, void ratio, porosity degree of saturation. Index properties of soil and their determination. Classification of soil. Permeability of soil, Darcy's Law. Factors affecting permeability. Determination of coefficient of permeability by constant head method. Shear strength of soil : Mohr – Coulomb failure theory. Measurement of shear strength by direct shear test. Plastic equilibrium of soil, active and passive status. Bearing capacity of soil. Rankines analysis, Terzaghis analysis.

An overview of Geosynthetics their uses in different fields. Testing of Geotextiles and their needs.

Designing for reinforcement on roads. Introduction, uses of Geotextiles. Mode of action. Design method with geotextiles by Giroud and Noiry method. Construction with geotextile. Design with geogrids for payments.

Bearing capacity improvement. Theoretical consideration, design procedure. Erosion control, conventional graded filter. Geotextile filter. Geotextile filter criteria. Geotextile survivability, construction criteria, Designing or stabilization with geotextile walls. Construction details, design method.

#### **Reference Books:**

1. Soil Mechanics-B.C.Punmia
2. Non-woven bonded fabrics- J.Lunenschlos, Publisher- Ellis Harwood Series.
3. Designing with Geosynthetics-Robert M.Koerner, Publisher-Prentice Halla, Englewood cliff

### **TTT 532 : ADVANCED TEXTILE WET PROCESSING**

#### **(L3-T0-P0): 3Credit**

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**Dyeing Process Developments & Kinetics:** Influence of fibre structure on dye uptake; Kinetics of Dyeing; Developments in dyes and dyeing processes for the dyeing of various textile substrates with various dye classes.

**Dyeing Machines Developments:** Advances in Mass coloration; Advances in cheese dyeing machines. Advances in Beam dyeing; Advances in soft flow dyeing machines, Advances in jet dyeing machines. Developments in jiggers, Continuous dyeing machineries & its developments, Various dyeing defects caused by the above machineries; Garment Dyeing & it's modern machineries.

**Color Measurements:** Spectrophotometric color measurement & analysis of dye solutions; Fastness properties of dyed materials and their assessment. Identification of dyes on fibres.

**Pollution & Eco Treatments:** Pollution aspects of textile dyeing; Modern approaches to eco-friendly wet processing of woven and knitted textiles. Eco-friendly dyes and their method of dyeing; Technology and principles of effluent treatment. Advanced color removal technologies, recovery and reuse of water and chemicals.

**Modern Printing:** Principle and working of fully automatic flat bed screen printing machine ;Rotary Printing machine; Transfer Printing machine-Digital Printing; Garment Printing machines; Various practical problems & possible remedies in the above printing machineries; Modern developments in textile printing machines/techniques.

**Advances in Finishing:** General overview of the recent technological developments in the area of textile finishing machines/techniques.

**Modern Finishing:** Formaldehyde free finishes; stone wash, Enzyme wash, Bio – polishing, Acid wash, sand blasting, leather finish, rubbery touch, feather touch, easy care finishes, wrinkle free and wrinkle resistant finish, water repellent finish, UV protective garments, Anti – microbial/ anti – bacterial inhibition finish, silicone softeners, fire retardant finishes for garments, functional finishes for garments; Micro- encapsulation and its relevance in textile finishing application.

### **Reference Books:**

1. Dyeing & Chemical Technology of Textile Fibres, By: **E. R. Trotman**; Published By: Charles Griffin & Company Ltd.
2. Fundamentals & Practices in Colouration of Textiles, By: **Chakraborty J. N.**; Published By: Woodhead Publishing India in Textiles.
3. Technology of Textile Printing; By- **R.S.Prayag**; Published By: Mrs. L.R.Prayag, Dharwad, Karnataka State.
4. Textile Printing; Edited By Leslie W.C. Miles, Published By: Society of Dyers & Coulisters(2003)
5. Technology of Textile Processing – Vol-IV "Technology of Printing" By: **Dr.V.A.Shenai**; Published By: Sevak Publications, Mumbai.
6. Technology of Textile Processing - Vol.6, "Technology of Dyeing" By: **Dr. V. A. Shenai** ; Published By: Sevak Publications, Mumbai.
7. Technology of Textile Processing - Vol.2,"Chemistryof dyes & Principle of dyeing" By: Dr. V. A. Shenai. ; Published By: Sevak Publications, Mumbai.
8. Book of Papers: **Convention on Natural Dyes-Dec-1999**; Published By: IITD.
9. Schindler W.D. and Hauser P.J., “Chemical Finishing of Textiles”, Woodhead Publishing Limited, Cambridge, 2004.
10. Chemistry & Technology of Fabric Preparation & Finishing, By: Dr. Charles Tomasino, Published By: Dept. Of Textile Engg , Chemistry & Science, College of Textiles, North Carolina State University, North Carolina.
11. Textile Finishing; By: **R.S Prayag**; Published By: Mrs. L.R.Prayag, Dharwad, Karnataka State.

## **TTT 533 : Garment Technology and Merchandising (L3-T0-P0): 3 Credits**

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**Introduction** – Sectors and structure of apparel industry, Overview of Indian garment industry, Nature & scope of apparel manufacturing industry and its developments in recent years.

Sequence of garment manufacturing process. Latest developments in garment technology.

Grading, Types and making of lay plan, Requirements of spreading, types and methods of spreading, spreading equipments and tools, cutting equipments and tools and their modernization, size charts etc.

Technology of Sewing machines, Sewing defects. Fabric sewability, principles of selecting proper stitch and seam types, Effect of stitch type on elasticity and strength, Effect of stitch type on seam slippage. Stitch less garments.

Garment dyeing and finishing, Value added garments. Pressing & finishing: object, classifications, means, components, machinery and equipments, garment finishing and inspection, Quality Standards of some giant retailers, TUV, SGS and ASTM testing standards.

**Production technology:** Manual systems, make through systems, straight line systems, modular production systems, unit production systems, quick response systems.

**Ware housing:** Handling equipments, storage equipments, packing equipments. Application of CAD/CAM in garment manufacturing

Definition and role of merchandiser, Buying indication, Market structure in export markets. Design buying influences. Merchandising and Range Development: Fashion forecast for Europe and USA, elements of design, Interpretation of forecast for brands in color, silhouette and fabrics. General range development and specific buyer range developments. Colors: International interpretation of colors. Market Research: Buyer behaviour, apparel brand management, advertising & promotion, Retail management, Pricing, Approaches for global markets: Effect on Global Economy Analysis of effect of international production and distribution of textiles and apparel goods on the global economy, Cost-plus and backward pricing, Elements of cost plus approach & cost sheet, Merchandise line pricing.

### **Reference Books:**

1. The Technology of clothing manufacturing by Harold Carr, Barbara Latham, Publisher – Blackwell scientific publications
2. Handbook for designing by Ritu Jindal, S. Malhan, Publisher - Mittal Publications
3. Managing Productivity in the apparel Industry by Rajesh Bheda, Michael T. Fralix, Publisher – CBS publications & distributors
4. The apparel industry in India, Ila Kantilal

5. CAD/CAM in clothing & Textiles by Grey and Stephens Publications – Gower Publishing, Hampshire, 1998.
6. Fashion Buying, Elaine Stone
7. Principles of Fashion Merchandising, Sidney Packard

### **TTT 534 : Advanced Textile Testing**

**(L3-T0-P0): 3 Credits**

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1. **Textile Quality Management Overview:** Quality and its importance, ISO system
2. **Fiber Testing:** AFIS- Principle, working and applications, Advantages over HVI
3. **Yarn Testing:** CTT- Principle, working and applications
4. **Fabric Testing:** KES- Principle, working and applications; FAST- Principle, working and applications
5. **Functional Testing:** Tests for Thermal Transmission, Moisture Vapour Transport, Combined Effect of Thermal and Moisture properties, Electrical Properties, Flamability
6. **IR Spectroscopy:** Principle and its applications for Cotton, Blend Analysis
7. **Testing for UV Protection:** In vitro and In vivo
8. **Labelling:** Woolmark, Care, etc.

#### **References:**

1. Progress in Textiles: Science & Technology, Volume 1, Testing and Quality Measurement, V K Kothari, IAFL publications, India, 1999
2. Intelligent Textiles and Clothing, H r Mattila, Woodhead Publishing Limited, 2006
3. Textiles for Protection, R A Scott, Woodhead Publishing Limited, 2005
4. Textile Testing Fiber, Yarn & Fabric, Arindam Basu, SITRA, 2001
5. Smart Textiles for Medicine and Healthcare, L Van Langenhove, Woodhead Publishing Limited, 2007
6. [www.nptel.ac.in](http://www.nptel.ac.in)

### **TTT 535 : Textile Composites**

**(L3-T0-P0): 3 Credits**

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1. **Composites:** Definition, Objectives, Classification, Applications
2. **Matrix Materials:** Polymers used, Properties of polymers, Thermoset and thermoplastic resins, Nonpolymeric materials
3. **Fabrication:** Hand lay, Bag molding, Pultrusion, Blow molding, Preformed molding, etc.

4. **Mechanics:** Isostress, isostrain conditions, Critical Fiber Length, Critical Fiber volume, Calculations for stress, strain and modulus; changes for continuous to discontinuous fibers, Failure mechanism
5. **Applications:** For structural engineering, electrical, civil, aerospace, defense, automobile, sports, medicine and others
6. Surface treatments, Flammability and fire resistance of composites, Laminated composite

#### **Reference Books:**

1. Design and Manufacture of Textile Composites, Long C A, Publisher Woodhead Publishing Series in Textiles
2. Composite Materials, K Srinivasan, Publisher Narosa Publishing House, Delhi
3. Analysis and Performance of Fiber Composites, Bhagwan D. Agarwal, Lawrence J, Broutman, and K Chandrashekhara
4. Composite Materials: Design and Applications, Daniel Gay, Suong V Hoa and Stephen W Tsai
5. Composite Material Science & Engineering, Springer Verlag
6. 3D Textile Reinforcements in composite Materials, Antonio Miravete, Publisher Woodhead Publishing Series in Textiles
7. [www.nptel.ac.in](http://www.nptel.ac.in)

#### **TTT 523: Industry Laboratory Practice II (L--T--P06): 03 Credits**

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Students can choose interested area in the field of fiber, yarn, fabric and garment technology. Students have to select any industry, related to area of their convenience. The syllabus of practical's shall be formed in consultation with subject co-coordinator & industry expert and finally take the approval from the department. Student should perform all practical's in the industry. At the end of the semester, they have to submit the report, attendance and industry certificate. Internal and external evaluation will be done as per the rules

#### **TTT 524 : Seminar - II (L--T--P02): 02 Credits**

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Seminar-I should be based on the literature survey on any topic relevant to textile technology. Each student has to prepare a write up of about 20 pages of "A4" size sheets and submit it in duplicate as the term work. The student has to deliver a seminar talk in front of the faculty members of the department during mid semester & end term. The faculty members based on the



quality of the work and preparation and understanding of the candidate, shall do an assessment of the seminar internally – jointly.

**TTT 525 : Case Study – II**  
**(L--T--P06): 03 Credits**

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Case Study – II should be based on the topics relevant to textile technology in the field of fiber, yarn, fabric, garment technology and management related to area of their convenience. Product development, trouble suiting problems, best practices etc. of the organization can be studied as a case study. The case study shall be framed in consultation with subject co-coordinator & industry expert and finally take the approval from the department. Each student has to prepare a write up 25-30 pages on “A4” size sheets and submit it in duplicate as the term work. The faculty members based on the quality of the work and preparation and understanding of the candidate, shall do an assessment of the case study internally – jointly.

## **SEMESTER III**

**TTT 541 : Dissertation Part - I**  
**(L--T—P16): 16 Credits**

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Candidates will have to undertake research work independently on a topic related to Textile technology and submit a detailed report of the same. He/She will have to defend the work carried out at the Institute practical Examination. He/She will have to submit monthly progress report of the work to the department, till the completion of the project work.

**TTT 542 : Seminar - III**  
**(L--T--P02): 02 Credits**

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Seminar-III should be based on the literature survey on any topic related to the project work/ textile technology. Each student has to prepare a write up of about 20 pages of “A4” size sheets and submit it in duplicate as the term work. The student has to deliver a seminar talk in front of the faculty members of the department during mid semester & end term. The faculty members based on the quality of the work and preparation and understanding of the candidate, shall do an assessment of the seminar internally – jointly.

**TTT 543 : Comprehensive Viva**  
**(L--T--P02): 02 Credits**

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At the end of the third semester there will be oral examination in the presence of an external examiner/ Group of examiners based on the syllabus of subjects of Part-I and Part-II related to the project work. Also it will be based on the Project the candidate will undertake during second year of M.Tech.

## **SEMESTER IV**

**TTT 551 : Dissertation Part - II**  
**(L--T—P20): 20 Credits**

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Candidates will have to undertake research work independently on a topic related to Textile technology and submit a detailed report of the same. He/She will have to defend the work carried out at the Institute practical Examination. He/She will have to submit monthly progress report of the work to the department, till the completion of the project work.