DEPARTMENT OF TEXTILES AND APPAREL DESIGN

PhD

Third Paper

2019 to 2020 onwards

Title-1

FUNCTIONAL FINISHES

UNIT-I

Textile Finishing Definition and Textile Finishing Classification: Based on Nature, Performance, Permanence, functionality, Environmental Concern and Media.

Functional Finishes for Textiles: An Overview: Introduction, Types of Functional Finishes: Mechanical finishes, chemical Finishes, Biotechnological finishes.

Finishes for improving Comfort and Performance: Thermal regulation finishes, Moisture management and Soil release finishes, softening finishes, shrink resist finishes, easy care finishes, Self-cleaning finishes, Superabsorbent finishes, Medical.

UNIT-II

Finishes for Protecting wearers and textiles: Insect repellent finishes for textiles, Antimicrobial finishes for textiles, Hydrophobic and Oleophobic finishes for textiles, Flame retardant finishes for textiles, Ultraviolet protection finishes for textiles, Radiation protection finishes for textiles, Antistatic and electrically conductive finishes for textiles, Biological and chemical protective finishes for textiles, Ballistic and impact protection finishes for textiles

UNIT-III

Nano Finishing: Fundamental principles, Nano finishing classification-Nanostructures, Nanolayer and Nano roughness, Application of Nano technology in various finishes, Synthesis of Nanoparticles, Techniques for characterization of nanoparticles.

UNIT-IV

Finishing with enzymes: Definition of Enzymes, Properties of Enzymes, Use of Enzymes in Textile finishes, Bio finishes for cellulose, Biopolishing, Denim bio wash, shrink proofing for wool, Action of Cellulase enzymes on cellulose, **Novel Finishes:** Anti-odour and fragrance finishes
Anti-pilling finishes, Elastomeric finishes, finishes to improve color fastness.

UNIT-V

Ecofriendly technologies for finishing: Plasma Technology, Ultrasonic, Super critical carbon dioxide, Laser treatment, Microencapsulation method. **Future trends in chemical finishing**: Cost reduction in greater efficiency, New effects, Easier application, Care of finished textile, Ecology, Smart Textile by finishing, Special finishes for textile designing.

References

1. Functional Finishes for Textiles: Improving Comfort, Performance and Protection, Roshan Paul, Elsevier, 2014
2. Chemical Finishing of Textiles, W D Schindler, P J Hauser, Elsevier, 2004
3. Nano finishing of Textile Materials, Majid Montazer, Tina Harifi, Woodhead Publishing, 2018
4. Textile Finishing: Recent Developments and Future Trends, K. L. Mittal, Thomas Bahners, John Wiley & Sons, 2017
5. Surface Modification of Textiles, Q Wei, Elsevier, 2009
6. Principles of Textile Finishing, Asim Kumar Roy Choudhury, Woodhead Publishing, 2017
7. Chemical Finishing of Textiles, W D Schindler, P J Hauser, Elsevier, 2004
8. Nanotechnology in Textiles: Theory and Application, Rajesh Mishra, Jiri Militky, Woodhead Publishing, 2018

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Title-2

SUSTAINABLE WET PROCESSING OF TEXTILES

UNIT I

Introduction to sustainability and the textile supply chain and its environmental impact: Environment sustainability, Social sustainability and Economic sustainability Overview of textile supply chain.

Green chemistry in the wet processing of textiles: Textiles-A serious threat to sustainable environment, Green chemistry and sustainability in textile sector, Recent sustainable chemical developments, Ionic liquids as green solvents in sustainable wet processing, Sustainable improvements of wet processing, Green chemistry in textile wet processing, Biomaterials in textile processing, Enzymes as biomaterials in textile processing, Biomaterials for dyeing applications, Biomaterials for finishing, plasma technology as green approach in textile processing.

UNIT II

Sustainability issues in Textile Wet Processing: Wet processing and wastewater generation in Desizing, Scouring, Bleaching, Mercerizing, Dyeing, Printing and Finishing.

Key factors for improving sustainability in dyeing and finishing: Accurate Color communication, Intelligent dye selection for product durability, Intelligent dye selection for chemical compliance, Intelligent process selection for improved resource efficiency, Waste minimization and pollution control, Current sustainable dyeing practices.

UNIT III

Water consumption in textile wet processing and sustainable approaches for its conservation: Introduction to water consumption in textile processing, Fiber, dye and process wise water requirement, Water consumption in processing of natural fibers, Water consumption in processing of synthetic fibers, Strategies for reduction of water consumption in textile processing: Developments in dyeing machinery and processes to reduce water consumption, Textile coloration by printing, spray and foam finishing of textiles, Low water or solvent based coating/nanocoating of textiles, use of supercritical fluid for low water processing, Ultrasonic wave-assisted textile processing. Textile processing using different irradiation techniques, Effluent generation and treatment: Different techniques to reduce pollution load

UNIT IV

Textile Wastewater treatment methods: Chemical methods, Physical methods, Biological and photocatalytic degradation techniques.

Sustainable Enzyme Application in Textile Processing: Applicability of enzymes at various textile processing steps: Desizing, Scouring, Bleaching, Dyeing, Finishing, Composting, Applications: Bio Polishing, Denim Abrasion and finishing, Desizing, Bleach Clean up, Bio Scouring. Life cycle assessment of enzymes used in the textile industry, Current trend application of enzymes in wet processing

UNIT V

Define the terms: azo free colorants, biodegradable dyes, chrome free tannins, fiber reactive dyes, heavy metal free dyes, low impact dyes, Nontoxic semi aniline dyes, chlorine free bleaching, Dry heat fixation, dye bath reuse, Eco bleach, Inkjet printing, vegetable tanning and wastewater recycling.

Ecological and sustainable Natural dyes: Introduction to natural dyes, History of Natural dyes, Classification of Natural dyes, Chemical structure of Natural dyes, Extraction methods of natural dyes, Mordant, Classification of mordants: Natural and bio mordant, Metallic mordants, Oil mordants. Conventional metal mordants and their environmental impacts, Mordanting methods, Advanced methods of natural dyeing.

References:

1. A Novel Green Treatment for Textiles: Plasma Treatment as a Sustainable Technology, Chi-wai Kan, CRC Press, 2014
2. Assessing the Environmental Impact of Textiles and the Clothing Supply Chain, Subramanian Senthilkannan Muthu, Woodhead Publishing, 2020
3. Sustainable Textiles: Life Cycle and Environmental Impact, R. S. Blackburn, Woodhead Publishing, 2009
4. Textiles and Clothing Sustainability: Sustainable Textile Chemical Processes, Subramanian Senthilkannan Muthu, Springer, 2016
5. The Impact and Prospects of Green Chemistry for Textile Technology, Shahid ul-Islam, Bhupendra Singh Butola, Woodhead Publishing, 2018
6. Green Apparels: A Sustainable Way of Apparel Manufacturing. Parthiban, M. R. Srikrishnan, P. Kandhavadivu, Woodhead Publishing India, 2019
7. Environmental Aspects of Textile Dyeing.R M Christie Elsevier, 2007
8. Environmental impact of textile production. Moore M.A, Fairchild books, New York 2008.
9. Water Recycling in Textile wet processing. Skelly J. K, Wood head publishing Ltd, UK, 2003.

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Title-3

INNOVATIVE PRODUCT DESIGNING

UNIT I

Definition of New Product: What is New product? **Categories of New Product**: New to the world products, New Category entries, Addition to Product Lines, Product improvements, Repositioning, Cost reductions. **What is New Product Development? Key New Product Development Functions and Cross Functional integration:** Marketing, Design, Manufacturing, Finance. Successful New Product Management, Critical Success factors for New Product development. **Key research issues in new product development**: Market Orientation, Innovation management, Time to market.

New Product Development Process: Different models of New Product development Process. New Product development in Textiles and Apparel: Case studies.

UNIT II

Innovation and New product development in Textiles: Disruptive innovation, Forces for innovation, Trends in textile innovation: Wearable electronics, biomedical, biomimetic and nano textiles. **Case studies in innovation in textile manufacture**. **Practical aspects of innovation in the textile industry**: Introduction and practical aspects of innovation, Meeting the needs of customers better than the competition, Innovation as a driver of new strategic issues in the apparel industry.

UNIT III

The Role of Design in New Product Development in Clothing: Criteria for Evaluating garments, Garment Collection development. **Developing a concept for a new collection**: Market and customer segmentation, Quality targets for a collection, Trademarks and their role, Process of defining a trademark, Product life cycle. Collection development management and control, Design and manufacturing requirements for a collection, Pattern construction and work planning.

UNIT IV

Functional Clothing: Design aspects of functional protective clothing, Design requirements for protective clothing. Engineering requirements in designing protective clothing, Multidisciplinary approach to functional protective clothing, Systems approach to the design, development and implementation of a functional protective clothing system. Complex design concept of functional protective clothing.

UNIT V

Value addition in textiles by Innovation: What is value of product, Value addition, Adding value to a product, How to improve the existing product. **Innovations in Future with Production and Retailing:** Augmented and Virtual Reality: What is Augmented reality, What is Virtual reality, Bridging the Online/Offline experience Gap in fashion retail through Virtual reality. Body Scanning technology for sizing, Digital moving and interactive prints on clothes, accessories or footwear, 3D simulated garments reducing over production, Augmented reality (AR) prints on clothing and in retail to reduce over production, Virtual reality and fashion for viewing luxury brand fashion shows, smart wearable clothing, personalization and consumer interaction, 3D printing.

Stages of Innovation: Product Idea to Commercialization: Technology Readiness level (TRL) definitions and descriptions

References:

1. Design of Clothing Manufacturing Processes: A Systematic Approach to Planning, Scheduling and Control, Jelka Geršak, Elsevier, 2013
2. New Product Development in Textiles: Innovation and Production, L Horne, Elsevier, 2011
3. Computer Technology for Textiles and Apparel, Jinlian Hu, Elsevier, 2011
4. Fashion and Textiles: Breakthroughs in Research and Practice: Breakthroughs in Research and Practice, Management Association, Information Resources, IGI Global, 2017
5. https://textiles.ncsu.edu/tatm/wpcontent/uploads/sites/4/2017/11/Choi_A2_full_final.pdf